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ELECTRICAL REVIEW.

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THE ELECTRICAL FUTURE OF BELGIUM.

THERE are in our midst a considerable number of Belgian electrical men who are waiting for the Allied Forces to drive out the somewhat firmly-entrenched invader. They naturally desire nothing so much as to return to their native soil, and resume as far as may be their former occupations; but while they remain with us they are anxious to turn to good account their expert knowledge of electrical affairs in Belgium. In that country, as in others, Germany played the card of economic domination in advance of military occupation. The gallant Belgian people, battered with mailed fist and trampled under foot meanwhile, will rise again, and in doing so they wish to snap for ever the shackles of domination of both kinds. We are strengthening our national organisation to break asunder those brutish military bands—what of the economic ones?

Reference to later pages of this issue will show that an effort has been made by Belgian gentlemen to secure the co-operation of British electrical firms in breaking the German economic hold upon Belgium's electrical trade. We are not sure that their preliminary effort was launched under auspices the most likely to secure success—indeed, we are not quite clear as to what those auspices actually are—but we believe that we represent the position correctly when we say that British electrical firms, whose co-operation is sought, and who at heart, we believe, desire to co-operate, can hardly have been aware of the existence of the movement. We do not for one moment believe that the electrical industry, however busy it may be making shells, would, as a whole, have cold-shouldered a meeting called by the electrical refugees of a nation for which we unanimously have so high a regard. Had the event been announced in time for us to notify our manufacturers and commercial men through the electrical Press, there might have been a reasonable number of British electrical men present to hear the excellent paper that had been prepared by M. R. Steylaers, and to show that as an industry we are not apathetic or disinterested in regard to the electrical future of the stricken country.

However, the slip that we suspect to have been made in the preliminary organisation need not, and should not, stand in the way of suitable fraternisation between Belgian and British electrical engineers, or prevent an adequate discussion of the situation as it was and as it ought to be, and of the best means for bringing definite and practical co-operative effort into being.

In order to assist to that end we have devoted space to-day to the publication of M. Steylaers's full statement, and we desire to ask our directors, principals, and managers of electrical businesses to study it with a view to discussion. It is proposed to hold a further meeting at which this paper shall furnish a basis for such discussion, and we hope that a goodly number of the aforesaid business men will find it convenient to attend and offer their observations upon the subject. It was obvious that our Belgian friends had somehow or other, somewhere or other, gained an unfortunate impression of the electrical manufacturers of this country, and if our firms had known of the meeting the impression might have gained some justification from the fact that they almost unanimously refrained from attending. Now the British manufacturer has quite enough to carry without being burdened with sins not his own, and we think that it will be as well if something can be done either by our electrical firms individually or through their organised body, to remove the opinion that we are not interested in the future of electrical trade and industry in Belgium.

We are not suggesting that the situation that presents itself is not one of great difficulty, but we do think that nothing is to be lost and everything is to be gained by presenting an open ear and engaging in a free and frank discussion of the problems with those who know the position so well from long and practical experience and who come to us asking for our co-operation.

On two points last week's meeting seemed to be fairly unanimous and emphatic. Belgium asks the British manufacturer to make for her what Germany has made hitherto —not simply what the British manufacturer has been in the habit of making; she also suggests that we shall "change our mind" and "change our methods," so as more hopefully to join forces with her and secure millions of pounds' worth of new business annually.

Will British firms listen to the appeal? We trust that they will do so, and if at all possible will take advantage of the opportunity. The time to consider is *now*.

The Rubber Position.

There was some interruption of business in crude rubber over the Whitsun holidays, but the market has held together very well indeed, a good portion of the improvement witnessed previously having been retained. Business has been fairly active, consumers taking supplies with a good deal of readiness, for they are running chock-a-block with Government orders for tires, and, indeed, for all sorts of material into the composition of which rubber enters. With the end of the month, however, the demand met with on the open market underwent a contraction, but this is always the case when expiring contracts are being adjusted, and a lull sets in pending a fresh movement. There has been lately a fully satisfactory demand for rubber on the part of American interests. There is not the least doubt that United States consumers are feeling the force of the war demands in great volume, and this necessitates the drawing upon the supplies of raw material which are in Europe to a considerable extent.

Rather a nervous feeling has manifested itself across the Atlantic lest there be any interruption in the shipments of material from here, and a distinct desire to cover future requirements has asserted itself. Large quantities of finished goods are being produced in America for shipment to Europe, but the precarious shipping facilities available, to say nothing of the dangers to navigation, have been acting as a deterrent factor in the forwarding of material. Possibly some day effective action will be taken against the Huns still at sea, and the waters cleared for the pursuits of peaceful vessels.

The reports issued by leading plantation companies indicate a steady improvement in the management of the estates. It is quite apparent that the comparatively poor times through which the companies have been passing have induced the exercise of an economy to which, in some cases, they were utter strangers in the heyday of the boom. Costs are now running lower, but there is a considerable divergence, which, however, is to be expected, between the returns of the better managed and more favourably situated concerns, and those which were floated as "ramps" upon the public.

An interesting report has just come to hand from the Acting Controller of Labour in the Federated Malay States, according to which the most notable feature during 1914 was the reduction in the labour force. The quarterly returns furnished to the Kuala Lumpur Labour Office showed a reduction in the Chinese working forces last year of 23,000, and a falling off in the Indian total of over 20,000. The fundamental cause is said to be the various economies introduced, arising from the relatively poor prices obtained for rubber and the consequent necessity of running plantations upon business lines. There was actually a decrease in the area of 474 selected estates of 25,000 acres, while it is rather startling to find that the area of cultivated land per labourer employed increased from 2·31 acres to 2·88 acres.

The F.M.S. cultivated rubber exports for March were 3,418 tons, making a total for the first quarter of 10,303 tons, against 7,323 tons for the corresponding period of 1914, an increase of 2,978 tons. The destinations were as follows:—

	March, 1915.	Jan.-March.	Corresponding period, 1914.
Straits Settlements ...	2 461	6,619	3,858 tons.
United Kingdom ...	921	3,407	2,860 ,,
Continent of Europe ...	—	1	357 ,,
Ceylon	33	180	199 ,,
Other countries ...	—	95	49 ,,
Total	3,418	10,302	7,323 ,,

The I.E.E. and the War.

That the Institution of Electrical Engineers has rendered valuable services to the military authorities during the war will be denied by none, and full credit should be awarded to the President, Council and staff for the really arduous tasks that they have been called upon to undertake, and have willingly performed; the amount of labour involved in these duties is not generally realised, and would astonish the members if they were fully informed regarding it. The desire of the members of Council to do everything within their power to forward the interests of their country is beyond question; yet they exhibit a strange reluctance to take any effective action in industrial matters, though these are second in importance only to the urgent requirements of the naval and military authorities.

In our issue of May 21st we quoted a paragraph from the Annual Report of the Institution, which indicated that a special Committee had been appointed by the Council 'to keep in touch with the British Electrical and Allied Manufacturers' Association in regard to the question of securing for British manufacturers the trade hitherto done by Germany and Austria-Hungary." The appointment of a Committee to deal with trade questions was an admirable step, though the terms of its appointment were more than a little singular. As shown in the Report, the representatives of the B.E.A.M.A. deprecated any action on the part of the Institution, and the Committee came to the conclusion "that no useful action on the part of the Institution appeared to be possible." The Committee "remains in being for the purpose of advising the Council"—to keep on doing nothing, presumably.

We cannot but express our regret that, even in these strenuous times, the Council displays the same timidity, the same lack of backbone, the same mental paralysis that afflicted it in times of peace whenever that vulgar word "Trade" was mentioned in its hearing. Like the hermit crab, at the approach of an unwelcome visitor, it withdraws into its borrowed shell; on this occasion it seeks the shelter of the B.E.A.M.A. But why can it not act alone?

In the leader referred to above, we welcomed the revolutionary change that had been brought about in the attitude of the Government towards the world of science—a fundamental change that will, we hope and believe, exert a profound influence upon the future of this country in all matters pertaining to industry and trade. The Government announcement followed closely upon the visit of a deputation from the Royal Society, the Chemical Society, and the Societies of Chemical Industry and Analysts. Why had the Institution of Electrical Engineers no share in that deputation? Will the Institution offer its assistance in the nomination of the Advisory Council on Industrial Research? Does it contemplate any action in the matter at all?

In referring to this matter at the annual general meeting of the Institution, the President pointed out that the Council had been criticised on the score of its inability to act in industrial matters, and remarked that the decision that nothing could be done in this instance was arrived at with the full concurrence of the B.E.A.M.A. Things must be left to solve themselves. With all respect, we submit that this was neither an explanation nor an excuse, but rather an aggravation of the fault for which the Council has been taken to task. The assistance of the B.E.A.M.A. in doing nothing was hardly necessary. The trouble is that nothing is done.

MERCURY-VAPOUR ARC LAMPS AND CONVERTERS.

ALTHOUGH the mercury-vapour lamp, and its associate the mercury-vapour converter, have been widely used in this country, they have not occupied a prominent position in technical literature of late; we have, therefore, made inquiries as to recent progress in this branch of electrotechnics, and believe the results will be found of interest.

The mode of operation of the mercury-vapour arc is probably well-known to the majority of our readers; unlike the Moore light, it is a true arc between mercury electrodes in an exhausted container, maintained by vapour distilled or otherwise evolved from the mercury surfaces. When used for illumination, the arc passes through a tube of glass or quartz; at the end containing the anode a bulb is provided, which forms a cooling chamber in which the volatilised mercury is condensed, the anode consisting either of mercury, iron, or carbon, while mercury is always used in the kathode.

The arc is usually started by tilting the tube, when the mercury flows from kathode to anode and completes the circuit; on allowing the tube to fall into its normal position, the arc is struck and maintained by the vapour column. The tube may be tilted either by hand or by a magnetic device.

A momentary cessation of the current extinguishes the lamp, and therefore it cannot operate on a single-phase A.C. circuit; this difficulty, however, is ingeniously overcome with the aid of an autotransformer with its extreme terminals connected across the supply mains and to two anodes in the lamp, while the kathode is connected to the middle point of the transformer winding. Thus one or other anode is always positive to the kathode, and by suitable design it can be arranged that the current never falls to zero. With three-phase supply, the kathode is connected to the neutral point and the phases to three anodes. The accompanying illustration, fig. 1, shows part of a large installation of Westinghouse Cooper-Hewitt lamps, with automatic starting, recently put in at the premises of Messrs. Stretton & Sons, Leicester; there are in all 104 of these lamps, which, thanks to their low intrinsic brilliancy, shed a soft light free from glare and comfortable to work with. The chief objection to the mercury-vapour lamp is the green colour of the light, which, while it does not interfere with the effectiveness of the illumination for most industrial purposes, results in the suppression of the warmer tints, especially of red. This defect, however, can be largely neutralised by the use of reflectors coated with a preparation of rhodamine, a fluorescent substance which absorbs yellow, green, and violet rays, and emits red rays. It will be noticed in the illustration that the lamps are provided with these fluorescent reflectors, the effect of the combination being to produce a light which is practically white; were it otherwise, it would, of course, be quite unsuitable for use in a sewing room.

Another application to which the mercury-vapour lamp has been found exceptionally well adapted is photo-printing, the light being rich in actinic rays, while its colour in this connection is wholly immaterial to the user. Fig. 2 shows a single Cooper-Hewitt lamp mounted on a stand which enables it to be adjusted to any desired position; this lamp is of 2,000 C.P., taking 660 watts, and is used for photographic printing. Fig. 3 shows a swinging frame fitted with similar lamps, which is used for "transfer" photo-printing from drawings on paper—not tracing paper—the light passing through the drawing-paper to the sensitised plate.

The frame contains 8 lamps mounted in pairs on four tilting reflectors, having a total candle-power of 8,000 C.P., and taking 3.08 KW.; it is suitable for making process plates up to 40 × 40 in., and similar frames are made up to 70 × 40 in.

The use of the lamp for sterilising water and other liquids has been fully described in our pages*; the water is passed through a chamber in which it is exposed to the rays from Cooper-Hewitt quartz mercury-vapour lamps, quartz being used in this instance to enable the ultra-violet rays, which will not pass through glass, to escape, and to increase their production by running the lamp at a higher temperature, these rays being the sterilising agents.

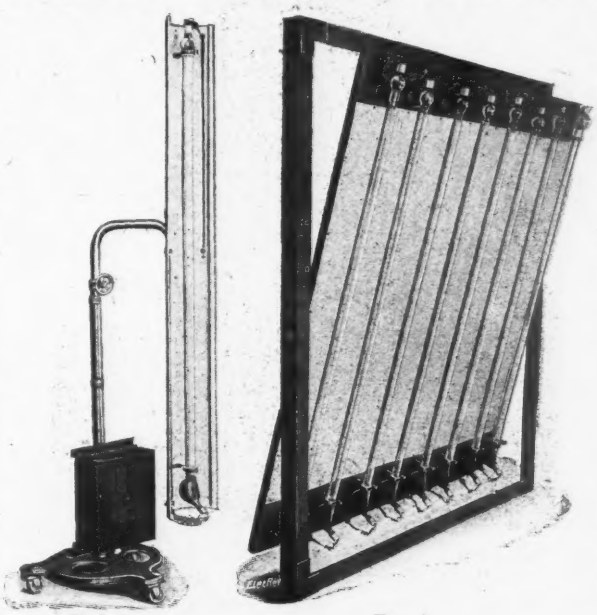


FIG. 2. FIG. 3.

MERCURY-VAPOUR LAMPS FOR PHOTO-PRINTING.

These apparatus are largely used abroad for sterilising public water supplies.

One of the most interesting applications of the mercury-vapour arc is to the conversion of alternating to direct current, by virtue of the rectifying property already referred to. In this case the lamp is made in the form of a large bulb with a chamber at the bottom for the mercury kathode, and two or more tubes at the sides to contain the anodes—two for single-phase and three for three-phase current. The large bulb forms a condenser for the volatilised mercury. The great advantage of the mercury-vapour converter is that it has no moving parts whatever, and can be left working day and night without attendance—a very important feature. With single-phase current a transformer with a middle terminal is used as described above; the transformer may be an auto-transformer where the A.C. supply is at the right voltage, but if this is not the case, separate windings are employed, giving any desired ratio of transformation. In circuit with the kathode or the D.C. leads of the single-phase converter is an inductance coil (as in the case of the lamp) which prevents the current from falling to zero between successive half-waves.

Used as a converter, the lamp has the advantage that the power dissipated in the arc is proportional not to the square of the current, but simply to the current, there being a practically constant drop of about 15 volts between the electrodes at all loads. Obviously, therefore, the higher the voltage employed the better the efficiency, the latter being at 200 volts over 92 per cent for the bulb alone; the additional losses in the transformer and sustaining coil are quite small. Also the voltage regulation at all loads is very good.

While the converter has been largely used in the United States for running D.C. arc lamps in series from an A.C. supply, and is being tried for traction on railways, in this country it has been used mainly for supplying kinematograph arc lamps and charging batteries. Many picture theatres have been equipped with Cooper-Hewitt converters, but the tendency to employ very large currents—often exceeding 100 amperes—of

FIG. 1.—SEWING-ROOM LIGHTED WITH MERCURY-VAPOUR LAMPS.

* ELEC. REV., Vol. 73, p. 516.

late has militated against their more extended use for this purpose. It is probable, however, that future improvements in the projectors will enable smaller currents to be employed, and in any event it is, of course, possible to run several converters in parallel. For charging batteries, the converter offers exceptional advantages, owing to its self-regulating property and the impossibility of reverse current flowing from the battery through the converter.

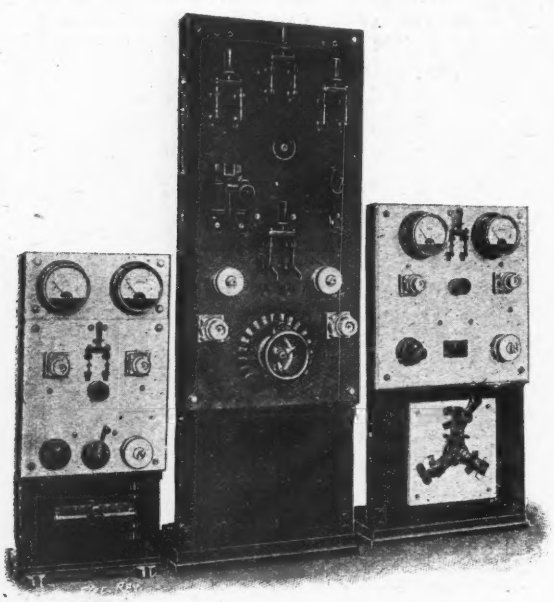


FIG. 4.—COOPER-HEWITT CONVERTER PANELS.

We illustrate in fig. 4 some converter panels recently installed by the Westinghouse Cooper-Hewitt Co., Ltd.; that on the left is one of many supplied to the Metropolitan Asylums Board for charging ignition batteries in connection with their motor ambulances (the Board use these converters at all their ambulance stations). The first was supplied for this purpose six years ago. The panel shown works on a 215-volt 83-cycle supply, and gives 5 amperes D.C. at three voltages, for charging circuits of 4, 8 or 12 cells, without supplementary resistances, except the small regulating resistance seen at the foot of the panel. The panel on the right is to be supplied to the Eastern Telegraph Co., mainly for charging batteries, at 10 amperes, 150, 100 and 75 volts, from a 110-volt 75-cycle supply. A special shunt is fitted to provide a small artificial load, enabling the converter to be kept running whilst supplying an intermittent demand for induction coils, etc. The centre panel is one built to the Post Office specifications, to give 30 amperes at 40 volts, when supplied at 200 volts, 50 cycles. The Post Office authorities have a considerable number of these converters in use for charging batteries in telephone exchanges, and it is especially interesting to note that the converter has to be suitable not only for charging the stand-by battery, but also to charge a battery that is actually connected to the exchange switchboard, without affecting conversations. Further, it must be capable of supplying current direct to the switchboard in the event of both batteries being put out of use.

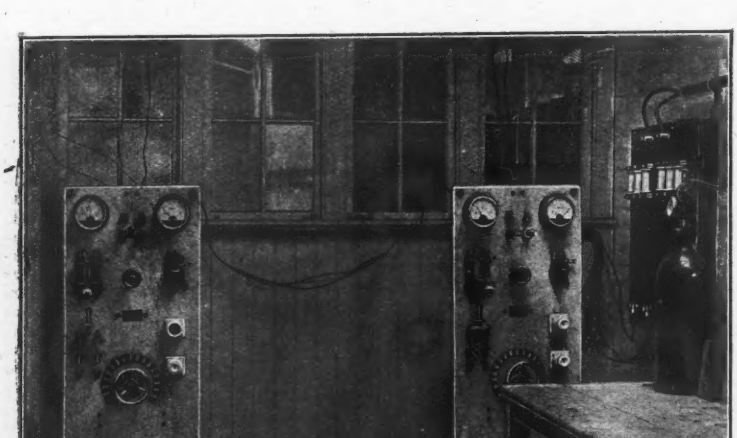


FIG. 5.—CONVERTER INSTALLATION AT THE NAYLOR BATTERY CO.'S WORKS.

By the courtesy of the Naylor Battery Co., we have been enabled to inspect and photograph a pair of panels which they have employed for the past twelve months for forming and charging their accumulators at their works in Balham. An earlier set was installed in 1912, and though at first some difficulties were experienced, these were successfully overcome—as will be gathered from the fact that additional sets were installed. These supply 80 amperes D.C. at 160 to 200 volts, and are fed from an A.C. supply at 205 volts, 50 cycles. Regulation is effected by tappings on the transformer primary. The fact that the apparatus can be left at work for days together without supervision is particularly advantageous in this connection, and the long life of the bulbs—some of which have run for over 4,000 hours—is in their favour. By means of a time switch, the charging process can be stopped at any time desired, and the properties of the apparatus render it particularly suitable for use in garages where electric vehicles are charged—a purpose to which the Naylor Battery Company's installation has been regularly applied, the company having an electric delivery van of their own. In view of the increasing use of electric vehicles, the matter is worthy of the attention of garage owners in areas supplied only with alternating current.

ANGLO-BELGIAN ELECTRICAL CO-OPERATION IN BELGIUM.

IN response to an invitation issued "under the auspices of the London Chamber of Commerce and the Belgian Committee for Trade with the Allies," we attended a lecture delivered at Cannon Street Hotel, E.C., on Thursday afternoon last week, the objects of which were announced as follows:—

"To bring together the British electrical supplies manufacturer, and the Belgian buyers, for the mutual consideration of the practical ways and means to establish business relations, immediately the invaded territories are free.

"1. How can the British supplies manufacturer secure the Continental electrical trade, hitherto in the hands of enemy countries?

"2. The desirability of the constitution of a U.B.E. (Union of Belgian Electricians) to act as intermediary between the British manufacturer and the Continental consumer.

"3. The selling and organising policy necessary to achieve this object, on a co-operative basis."

The chair was taken by Mr. A. H. LAWRENCE, Vice-President of the British Chamber of Commerce in Belgium, who, in opening the proceedings, referred to the opportunity that existed for England to capture the very large business that had been done between Belgium and Germany. The trade was there for the Englishman if he was prepared to make some little effort and sacrifice, but such effort and sacrifice would be well repaid. On behalf of the London Chamber, the speaker said that they would be pleased, through their Electrical Section, to give every assistance to any gentleman who might require it in these matters. The Chairman trusted that the British Chamber in Belgium would be of some use to them and that when they were once again established in Brussels, the Belgian Committee of Trade would be in existence, and that hand in hand with that committee they would be able to drive out the commercial German from Belgium.

The proceedings which followed were chiefly conducted in French. The lecturer, M. R. STEYLAERS, an electrical engineer who had been prominently connected with a number of Belgian concerns prior to the war, read his lecture, and for part of the time it was read in sections in English also by Mr. Barwick. About half-way through, however, owing to the

meeting consisting almost entirely of Belgians—about thirty were present—the English translation was dispensed with. We refer on another page to what we believe to be one of the reasons for the un-English character of the audience.

M. STEYLAERS first expressed thanks to the London Chamber of Commerce and the Belgian Committee of Trade with the Allies, for their efforts in convening the meeting. He was approached by the Belgian Committee to develop through the medium of a meeting such as that a definite and positive policy that could be operated immediately Belgium and Northern France were free. The speaker considered that an open discussion was preferable for the mutual exchange of ideas, to an individual exposition, hence the calling together of the manufacturers of British electrical supplies and Belgian buyers to study the most appropriate means of realising the object expressed in the invitation. Addressing himself to Belgians present, he regretted that at the exhibition along the lines of the Leipzig Fair, recently held at Islington, for toys and cheap ware, space could not be allocated for the exhibiting of the productions of British manufacturers who would take part in the rebuilding of Belgium, and whilst appreciating the spirit that prompted the exhibtion, suggested that, as Belgians, they would have been interested in seeing those products which would enter into the industrial rebuilding of their country. It was admitted that the exhibition was for the development of British trade at home and in the Colonies, but the British manufacturer could not successfully confine his efforts to the British Empire alone. If he was to beat German competition, he must find a world market. The production of cheap articles necessitated an enormous demand, which could not be responded to by the British Empire alone. There was, however, a scheme under consideration to organise an exhibition of the products in which they were interested, and steps were being taken by various committees to obtain a *venue* for this purpose. When these arrangements were completed an announcement would be made in due course. These introductory remarks were rendered necessary to lead up to the policy to be considered, stripped of generalities, without exaggerating the possibilities or ignoring the difficulties. The principal phase was the industrial rebuilding of Belgium, embracing, as it did, the industry of electrical engineering and manufacturing of electrical supplies, and the selling of these products to Belgian buyers at the termination of the war. The speaker considered it a duty to assist in the re-organisation and establishment of the new economical conditions as a compensation for the sacrifices of the Allied Armies. He referred to the already enormous damage, and anticipated the total destruction of the remaining workshops and industries when the affected territories were reoccupied. M. LeRoi Beaulieu, the leading French economist, maintained that from the German point of view the war was not so much a sentimental as an economic war, and subsequent events had substantiated his contention. Belgian machine tools in all factories were being transferred to Germany, raw material had been appropriated, the enemy had stolen and was utilising commercial secrets, and was disclosing in the interested quarters the names of Belgian customers, for it must be remembered that prior to the war German manufacturers were beginning to fear the effects of Belgian commercial development. For present purposes, it was necessary to make a careful analysis of the conditions as they existed before the war.

The greater part of the electrical supplies was either directly or indirectly controlled by Germans. In Belgium there was first, the Belgian Union Co., Ltd. (A.E.G.), in reality a branch of the renowned 'Allgemeine Elektricitäts Gesellschaft, Chaussée de Charleroi in Brussels, similar to the Parisian concern, the Société Francaise d'Electricité (A.E.G.), 72, Rue d'Amsterdam. As a matter of fact, these companies were Belgian and French in name only. The Belgian company had (if the speaker remembered rightly) a capital of one million francs, and the French company a capital of two million francs. The object of the company expressed in the articles of association was "for the exploitation of workshops for the construction of electrical supplies generally, and particularly the production of the Allgemeine Elektricitäts Gesellschaft, Berlin Co., Ltd., with a capital of seventy million francs. The name of the directors of the so-called French company would indicate their nationality: Messrs. M. Mamroth, Ross, and Koch, together with Messrs. Thurnauw and Burrell, the last two gentlemen being also on the board of the French company for exploiting the Thomson-Houston patents. Due to these directors being associated with both companies, it need only be said that the two interests were not allowed to clash. There was also in Belgium the Siemens-Schuckert Co. and the Siemens & Halske Co. (Rue Thérésienne in Brussels, and Rue de Dunkerque 52 in Paris). The articles of association of these companies stated "that their object was for the sale in Belgium and France of the productions of the two German companies, Siemens & Halske and Siemens-Schuckertwerke Aktien Gesellschaft mit Beschränkter Haftung. Further, the French Siemens' company acquired a large monetary interest in the French concerns of La Compagnie d'Electricitié de Criel, Ltd., with a capital of 3,800,000 francs, with head offices at 19, Rue Louis le Grand, in Paris. This company was the former French concern Dayde & Pille, Paris. The speaker then mentioned the names and directors of other apparently French electrical concerns which were actually branches controlled by the German Siemens company:—

1. La Société Industrielle d'Energie Electrique, 30, Rue Caumartin, Paris. Directors: Messrs. Cahen, Petri, Simler.

2. La Société d'Electricité de Varsovie. Directors: Messrs. Salomon and Cahen.

3. La Société Continentale de Traction et d'Eclairage. Directors: Messrs. Cahen, Petri, Rosenbaum.

4. La Société des Applications de l'Electricité à la Traction. Directors: Messrs. Von Chauvin, et Von Siemens Natalis.

The aggregate capital of these four companies was 32 million francs in shares, and ten million francs in debentures.

In Belgium there was also the Electric Dynamo Co., Lahmeyer, recently acquired by the A.E.G. Against these big German corporations (which, the speaker incidentally remarked, he regretted were partly financed by French and Belgian capital) there existed the Belgan concerns—the Ateliers de Construction de Charleroi, under the financial control of the Belgian group Empain; the Pieper Co., in Liége, for the construction of electric motors; and the Ateliers des Cables de Seneffe, for wire and cables. In France there was the Electricité, the Nancy Co., and Electromecanique Co., producing high standard dynamos, The British trade was represented by the Westinghouse Co., the British Thomson-Houston Co., and the Tudor Accumulator Co., and, prior to the war, the General Electric Co., for supplies. For these concerns, however, the competitive fight was unequal against the financially strong German trusts. The latter, due to their resources, were able invariably to secure the business, being in a position to cut their profits to a minimum. They were able to engage in aggressive selling policies, and, in certain instances, their productions were of a superior quality, particularly the German Siemens productions. This company was favoured with many French and Belgian Government contracts. In France, La Compagnie d'Electricité de Creil (controlled by the German Siemens Co., as stated) were fortunate enough to number among their clientèle the French Admiralty. In 1899 the same concern obtained the orders for searchlights for the fortifications of Bizerte, the electrical equipment for the departmental railways in the Province of Haute Vienne, and the electrical railways of the Bois de Boulogne. In Belgium it was the same; Government contracts were secured by these firms, and, in view of the circumstances, it was interesting to remember the harbour of Zeebrugge, the electrical equipment of which was well known to the enemy, a tactical knowledge which they had employed to advantage against the Allies, as they were well aware. The same remarks applied to the electrical equipment of the forts around Antwerp.

In the wholesale business the same policy was apparent. A concern in Brussels, with a wide Continental reputation, Messrs. Poock & Hermann, possessed perhaps the most complete stock of electrical supplies on the Continent, comprising some 5,000 specialities. Belgian electricians would remember the principals of this company visiting Belgium some ten years ago in the capacity of ordinary salesmen submitting samples. A few years later, backed by the financial support of a number of manufacturers of German electrical supplies on a co-operative basis, they acquired a unique standing in the Belgian market, securing a substantial portion of the trade. Catalogues of an expensive and elaborate nature were freely distributed by this house, and, when one considered the modest nature of their operations in the initial stages, it was obvious that the success attending their activities was only possible with the support of the manufacturers they represented. There were, of course, Belgian wholesale houses, but they were unable to compete with the German wholesaler. These concerns endeavoured to sell outside the Trust, but high individual selling cost, and the question of individual credit, mitigated against them to such an extent that their success was limited.

Immediately before the war, the A.E.G. Co. were responsible for the last phase of their carefully and skilfully prepared scheme, and approached the consumer direct, thereby eliminating the intermediaries' profit. This company submitted prices for the execution of electrical installations not only in large enterprises, but also those of minor import.

Naturally (as was always the case when the middleman's position was endangered) the retailer resented what he considered was a violation of his rights; therefore, when this resentment was strongly expressed, the A.E.G. Co. condescended to withdraw their quotation in favour of a Belgian concern, on the mutual understanding that in the event of the particular concern securing the business, the order for the material necessary for the execution of the installation be placed with the A.E.G. Co. They might, therefore, assume that 95 per cent. of the Electrical Supplies business was dominated and controlled by German manufacturers. They secured the contracts of the public services and private businesses. How could the Belgian workshops (however soundly established) profitably meet this competition? They even feared to try, because they realised that the object of this competition was that inseparable from trust and monopolies, namely, to crush every suggestion of competition by selling almost at, and sometimes below cost, and when the purpose was achieved, to inflate prices, and thereby redeem the small profits of the past, and create large profits for the future.

The position was identical in the telephone and electrical lamps part of the industry. In Belgium the Telephone Co. La Societé de Téléphonie Privée recently had to contend with aggressive competition from the Berliner Co., L' Otomat, who, by skilful and persistent publicity, invaded the public services,

Banks and Government Offices. Paris had also to contend with this competition where the German company competed against the French company under a French name, flooding the market with German raw material and telephone apparatus, employing German labour, and gaining entry into the administrations of the French Government, the military circle of the Avenue de l'Opera in Paris, the town councils of the 9th and 10th arrondissement in Paris, the town councils of Clichy, Dunkirk, and Maubeuge, and obtained the concession of the telephone installation of the International Exhibition in Lyons. It was not surprising that this free licence of entry had been utilised to advantage by German espionage agents.

Relative to the electrical lamps sold in Belgium and France, it was only necessary to name the concerns and trade-marks to determine their origin. As a matter of fact, all the German houses selling these lamps had their own offices in Brussels. They were the Osram Lamps (Auer Gasglühlicht A.G.), A.E.G. Lamp (A.E.G. Aktien Gesellschaft), Pope Lamp (German Pope A.G.), Wotan Lamp (German Siemens). Against this combination the only competing lamps were the Philips and Tantal Lamp, of Dutch manufacture, and the Z Lamp, of Belgian manufacture.

Appealing to his own countrymen, the speaker queried them as to whether they were prepared to continue to be dominated by the German manufacturers, and suggested that the spirit animating all Belgians was the desire to recover their economical independence, in the same way as they were reconquering their territorial independence. The problem, however, was not a simple one, and presented many difficulties. It would necessitate the co-operation of all the interests engaged—the co-operation of the British manufacturers, the co-operation of the Belgian consumers. In a legitimate manner it was possible to commence where the German manufacturer left off, to ascertain by analysis the causes of his success and development, and to extract the best from his operations and apply them to the scheme of reconstruction. But *he must be kept out*, and the Belgian Parliament must, and would, create a tariff wall to assist to this end.

Examining the causes of the development of the German industry generally, and not only confined to Belgium and France, they arrived at the following conclusions as to essentials:—

1. Large stocks on spot, and keen competitive prices resultant of an actual knowledge of productive costs.
2. An elastic credit policy, together with an efficiently trained selling organisation, and the operation of intensive and extensive selling policies.
3. The extensive publicity to focus attention upon German productions.

Relative to the question of stocks, the Belgian and French retailer or contractor had given, and would continue to give, the preference to the supplier who was in a position to execute his (the retailer's) requirements from stock, in large or small quantities, thereby avoiding the investment of his capital in stock. British concerns established in Brussels before the war could substantiate this statement. Purchasers would not hold stocks, and the difficulty of importing material from countries where the language, currency, and measures were different would be appreciated. The Continental electricians worked practically always with the capital of the wholesaler. The ultimate purchaser desired to see samples before purchase, and refused to buy on catalogue. The prevailing conflict had demonstrated that psychologically the German was prone to err, but he appreciated this Continental commercial weakness, and adapted his methods accordingly, with advantage to himself.

The British manufacturer, on the other hand, appeared to be obsessed with the selling power of his catalogue, and considered that through this medium he could create sales and induce customers to carry stocks. Frankly, he was wrong, and the possibility of his securing business along these lines was not only remote but almost impossible. The Continental purchaser sent an employé to the wholesaler for his daily or weekly needs, and often took the liberty of returning any surplus he was unable to utilise.

The policy of cut prices by the German producer might, from the point of view of the British manufacturer, superficially appear to enhance the difficulty of taking advantage of this new market, but a closer investigation would satisfy him, that by a system of specialisation it was not only possible to produce the goods in which the Germans specialised, but to produce them at a *profit*.

Now was the opportune moment for the British manufacturer to take advantage of the forced residence in this country of the Belgian electrical specialists, to collaborate with them as to the potential requirements, and to carefully analyse the question of price and productive cost, and by this process to arrive at such an understanding as to establish a sound and satisfactory foundation.

Concerning the question of credit. Not only had the German manufacturers co-operated in order to maintain stocks, but they had skilfully organised the credit side. Practically the whole German commercial policy was based on extensive credit, made possible by the German banking system, which had made possible German industrial development of the markets of the world. In fact, immediately before the war, it was not unusual for credit to be extended by bankers to the German manufacturer over a period of one or two years, particularly in fancy articles. The complicated process of this credit system might be interesting to consider. The basis was the repeated renewal of bills on the customers in the markets of London and Paris by the German banker, the manufacturers discounting the bills on the customer in the same way with their bankers, with the cash from the operation in the London or Paris market.

A common process was as follows:—When a manufacturer's business reached a volume where his own financial resources would not allow the execution of same, he went to his bankers, who satisfied themselves as to the financial status both of manufacturer and his customers, and entered into an arrangement with the manufacturer as follows:—They, the bankers, agreed to advance 15 per cent. to commence operations, 25 per cent. on the completion of the manufacture of the goods, and 25 per cent. against bill of lading, the outstanding 35 per cent., which represented gross profit, remaining in the bank as a nucleus fund for the next operation on similar lines. Backed by such a financial system it was not surprising that the German manufacturer by the might of his credit monopolised the Belgian market.

In regard to Selling Methods and Publicity, the selling representative was carefully selected and trained, was paid a substantial remuneration which gave him a good social position and made an impression on the customer. If it was not possible for financial reasons to engage such a salesman, the manufacturer would co-operate with other manufacturers producing non-competitive products appealing to the same customers, and the expenses would be shared. The German manufacturer was not a successful pioneer, but essentially a copyist. If he desired to exploit a new market he instructed his most progressive salesman to go to this new market and procure samples of the goods commanding the best sale, with prices and discounts allowed by the manufacturer. He then analysed the proposition to the minutest detail, eliminated any feature that he considered superfluous, and based his productive costs on an enormous output. A few weeks later the salesman was back again offering a copy of the article in question, at lower prices and on better credit terms, so that he was able to secure large orders and contracts immediately. It was this process of elimination that had been responsible for the stigma associated with German manufactures on the Continent, viz., "German rubbish."

The indirect system was more insidious, and was a system of commercial espionage. A German clerk subsidised by a German manufacturer entered a Belgian office or factory, under the pretence of learning the language at a very low salary, and dispatched to his employers the names of potential customers, and kept them furnished with data and information that could be used to advantage. Addressing his Belgian friends, the speaker emphasised the dire necessity to free themselves from the corrupting and pernicious influence of the German domination. Direct and indirect trade with Germany must be met and defeated by aggressive policies, and he called for the abolition of German companies trading under Belgian names.

It was clear that immediately the invaded territories were free and capable of reconstruction, the German supply of cables, tubes, dynamos, wire, materials for high and low tension, supplies for installation, fittings, etc., would not be available, even assuming the Belgian electrician was prepared to purchase from this source. Practically everything would have to be replaced. In Belgian factories cables were being appropriated by the Germans for the utilisation of the copper for producing shells. The electrical conduit systems, central stations and sub-stations were totally or partly destroyed, and as had already been suggested, when the invaded towns were reoccupied the destruction would be complete The problem therefore resolved itself into the question, "Where are these supplies to come from?"

The United Kingdom, and to a certain extent France, produced high standard electrical supplies, and nothing seemed easier than to transfer the business to these countries, but the difficulties were more real than apparent. In the first place the supplies used hitherto were of a different character and nature to those supplied by the United Kingdom and France. In fact it would be necessary, were English supplies sent as used in England, to educate the workmen along totally different lines to what they were accustomed to, and therefore it was obvious that it would be necessary to reduce this difficulty to a minimum. The customer was conversant with his needs and expected to have them satisfied, and would not tolerate having to alter his methods and change conditions to what the manufacturer considered his needs should be.

The object, therefore, of the Belgian electricians should be to induce the British manufacturer to produce such goods as would meet his actual requirements, habits and working methods.

They must not be deceived into the belief that the resourceful German manufacturer would lose the market without making an effort to retain it. If it was possible to get supplies through to a country with which he was at war, the ways and means would be found with less difficulty after the war to retain this business. The speaker was of the opinion that his countrymen would have to fight hard to be masters in their own house.

It was necessary that the Belgian trade should suffer as little as possible as a result of the change involved. This particularly referred to the small retailer who would require all the assistance he could get in order to restore the normal current of industrial activity, interrupted by this crisis for which there was no precedent in the economic history of any

nation in the world. The British manufacturer, however, could not be expected to change entirely his commercial methods for the express benefit of Belgium. The primary consideration of the British manufacturer before exploiting a new field was that of the safety of his credit. He desired to make good his operations, and if he was satisfied that the risks were too great he preferred to leave the matter alone. The question expressed frankly was, "The Belgian electrician desires credit, and the British manufacturer wants the business *and the money*." How can these interests be reconciled?

The speaker had occasion to discuss this matter with British manufacturers in his initial efforts to interest them in the Continental markets. His impression was that whilst they were prepared to stock their goods on the Continent, they would only do so after a demand had been created for them. He suggested that this would be willing the ends without the means, but appreciated their reluctance due to the fact that the exploitation of a new market necessitated additional capital. The system of banking prevailing in the United Kingdom did not encourage the manufacturer along these lines, and he was therefore abandoned to his own financial resources, and must develop his business slowly. It was necessary to adopt financial measures for the constitution of a corporation to act as a clearing house to transmit orders to the Allies, the development of Belgian national manufactures taking place during the interim.

The proposal was, therefore, that an organisation be created to act as a connecting link with the manufacturer and the purchaser. This organisation would appeal to the wholesale trade, and replace the German organisation operating before the war. The speaker's suggestion was the creation of a corporation under the name of "The Union of Belgian Electricians" (U.B.E.), displacing the other Union, which was Belgian in name only.

The U.B.E. must be a strong representative association of Belgian electricians with an initial capital of not less than one million francs (£40,000). Its object would be to represent on the Continent British and French manufacturers of electrical supplies, and, when conditions permitted, to encourage the Belgian electrical supplies manufacturer.

Such a corporation patronised, solidly backed, and scientifically organised in regard to the selling policy, would obtain better credit terms from the manufacturers than those extended to any individual outside its scope.

The manufacturer would be in a position to make good his credit immediately. He might give credit as occasion demanded—30, 60, or 90 days, or as the case might be—and he would be in a position to discount his bill on this corporation with his bankers. It would encourage him to place stocks at the disposal of the Corporation and to draw on the corporation for such stock at 90 days, six months, or nine months.

Further, the corporation being on the spot, would have a better knowledge of the financial status of each customer and, moreover, would of necessity be more conversant with the prevailing conditions.

It would be part of the task of the U.B.E. to encourage Belgian industry by placing their orders with the concerns specialising in a certain phase of electrical supplies and who were hitherto exporting their productions, such as the dynamos manufactured by Pieper Co., Liége, already referred to.

In short, the U.B.E. must be the financial crutch whose object was to assist the Belgian electrical industry to rise above its industrial upheaval, with the assistance of foreign suppliers, who would in turn benefit by their share in the enormous demand for their goods. All specialities handled by the corporation would be sold under the manufacturers' name and trade marks, and every effort would be made to place the business with those manufacturers interested in the corporation, thus creating a goodwill for the manufacturers' goods. Was this proposal worthy of consideration by the British manufacturer? The time for talking was past, the time for practical effort was now! The opportunity must be accepted NOW, otherwise Belgium would be reluctantly compelled to re-open relations, because of urgency, with the nation which had prostituted all that she held most dear. A peroration of rhetoric in regard to the national side of this people would not be acceptable to business men met together for a business purpose, but would it not be repugnant to the finest feelings of this nation to be obliged to turn to her enemies for the material to rebuild her battered cities, her demolished and ruined towns and villages, made such by the ravages of these enemies? The prospect of Germany making profit at the expense of the brokenness of Belgium would be an inconceivable irony.

Belgian electrical experts in this country waiting for their country to be freed—might be here a few weeks, or perhaps a few months. This period should be utilised by these gentlemen and British manufacturers for an interchange of ideas, because the moment the invaded territories were free the refugee population in this country and France would rush back to their homes and would commence themselves to rebuild their country out of the ashes. The speaker, in closing, emphasised that which had punctuated the whole of his discourse—"THE TIME TO ACT IS NOW!"

Mr. TOWNSEND, who said he represented the selling end, addressed the meeting at some length. He was disappointed to see so few British manufacturers present, and dwelt generally upon such matters as the study of productive costs, the importance of the selling end being right, the necessity for standardisation of specialities, the importance of co-operation and intensive advertising. "Combination must be met by combination, syndicate by syndicate, publicity by publicity."

Suggestions having been made that the absence of British electrical manufacturers from the meeting was due to apathy on their part, Mr. Albert Bridge (ELECTRICAL REVIEW) asked those present to suspend their judgment on that matter until they knew whether British electrical manufacturers were aware of the proceedings, whether they had been approached through their organisations, and whether such notices as were issued to the Press were issued too late for the matter to be announced in any way before the meeting actually took place. He thought Belgian gentlemen present could feel assured that British electrical men were not indifferent or apathetic in regard to the future position of electrical affairs in Belgium. It had been the ELECTRICAL REVIEW'S privilege to welcome to this country and assist many electrical engineers who had come here after the German onrush, and he believed that the hearts of all British electrical men were with them; let them not too hastily hold them guilty of apathy. M. Steylaer's excellent address contained much valuable material, but it told again the same story as had been heard for many years past of the methods adopted by German interests in all parts of the world for undermining others' trade. He believed that British electrical manufacturers were with those present in their desire and determination to rid Belgium for the future of the German electrical domination.

As the result of suggestions from the meeting, it was proposed that another meeting be held on a date to be fully and well announced so that British electrical firms should be afforded a better opportunity of discussing the subject, M. Steylaer's paper forming the basis for such discussion.

GERMAN BUSINESS METHODS.

IN the course of his address to the Sales Managers' Association on "German Business Methods as seen by a Canadian Resident in Berlin," Mr. J. H. Vickery said he was not qualified to refer to those business methods in detail, but he spoke as a lawyer who came into contact with a great many kinds of business in Germany. He was first struck by the "great wedding," "the nuptual union between theory and practice, the fructification of science by its application to commerce, to industry," and to the welfare of the community generally. Mankind did not exist for science, but science existed for mankind. The Germans had been more practical than we in the application of science to increase the store of human happiness (Who said *Lusitania*? Who said Zeppelin?). Some 21 great German Universities had taken a leading part in the study of applied science—that was a difference between the German and British University. Oxford and Cambridge were magnificent institutions, but they were not perfect. An American professor in Berlin had said that the German University was not an institution of education, but one of instruction, to instruct the mind, to give it a store of knowledge, to fit it out with all the details which it required to enter into the practical work of commerce and industry. Those who left the British Universities might not have the mind stuffed so very full of the facts of human knowledge, but they possessed a greater ripeness of character, and a greater knowledge of the mutual psychology of the people. The American professor thought that the American University combined the better features of both systems; certainly on its practical side the Cornell University was admirably fitted to prepare a young man to enter his life's work. University education had come to be regarded in Germany as a *sine quâ non* for almost every man who made any pretension to "culture." There were 21 such institutions of learning, with a total student membership of nearly 70,000, and there were 11 technical high schools with something like 17,000 students. There were 400 other institutions of various kinds for the study of almost everything that entered into human life, and there were the so-called continuation schools for enabling the student, when he went into the workshop, to keep up the habit of being a student, in his spare hours. Scientific training was the one great thing upon which they had expended their best efforts—in the eyes of an American observer there was nothing comparable to it in the whole world.

The speaker next referred to the subject of selling, marketing, and distributing goods, and said that the power of the people to develop their natural products and to create artificial products had been supported by a wonderful linking up of the scientific institutions and of the administrative, political, and even diplomatic institutions of the Fatherland. That was one reason why their success had been so prominent. There had been no working at cross purposes; there had been team work. In regard to linguistic aids to marketing and selling, the ability to command one or more foreign languages constituted an aid of undoubted value. The commercial value of foreign languages had long been recognised by Germany; facility of acquiring and speaking them had constituted a most valuable factor in the development of German commerce and industry. We must spend less time studying ancient languages and devote more to a better understanding of the languages spoken by the Allies. The influence of law upon commerce and industry was next referred to by Mr. Vickery. He gave a few illustrative examples to show the process of linking up law with actual business. Accident insurance was mentioned, also

transport. The question of internal transport was one that had received close and thorough consideration in Germany from many points of view. The Government owned and controlled the railway system, and there was a truly wonderful system of inland waterways linking up the German rivers and harbours. The far-reaching State control of the railways had been exercised in the interests of business and of the industrial public, and therefore by necessary implications in the interests of the State itself. It had been found possible to combine rigid economy of administration with high efficiency of service. The canal system afforded a remarkably cheap transport for slow freights, and at all times of the year except mid-winter long lines of man, horse and machine-propelled barges might be seen gliding slowly along the canals of the Fatherland, laden with goods; the main thing was that the freight was remarkably cheap. On the influence of political policy on business, the speaker said that the chief business of the statesman and the chief business of the diplomat was to order commerce and industry in their widest sense as the foundation of human existence from day to day. According to the German view, commerce, industry and all other peaceful pursuits became part and parcel of a huge militant system founded on power, brutal, egotistic and devoid of that altruism of a people who recognised and welcomed the rights and claims of other nations. According to this view there was no room in this game of life which men and nations play, for anything like friendly competition or for generous rivalry, such, for instance, as had been found compatible with the hundred years of peace as touching the relations of the United States and Great Britain. According to the German idea, all was war! war! war! Peace was merely another state of war—it was warfare in abeyance until the rivalries happily ripened into the hostilities of the battlefield, and war became the noble consummation of the conflict for which the so-called peaceful pursuits had laid the foundation. This was the process which had been going on in the mind of militant Germany for a number of years. This fact explained the remarkable growth of the Social Democratic party in Germany, which, although everything had been done to make it happy and contented, as, for instance, accident insurance, old age pensions, sick insurance, education, and the greatest possible freedom in personal habits, was, nevertheless, discontented, did not like the Kaiser, did not like his ministers, and did not like the whole business. When the war was over a good many things were going to be discussed in the Fatherland, and he thought that the Social Democrats would play a leading part in that discussion. We, to-day, were fighting the same fight as the Social Democrats had themselves been fighting for years, the fight for constitutional responsible Government.

Mr. Vickery put in a plea for a reconciliation in this country between Free Trade and Protection. The matter was acquiring a new meaning in these days, that was his excuse for touching it. The gradual evolution of Greater Britain into something which might be called a federation must, in the course of the years, bring with it as an economic and historical necessity something like an extension of the principles of Free Trade in the shape of inter-Imperial trade. The necessity for the better linking up of all the functions of Government and of business and education—the mobilisation of our resources—was Mr. Vickery's closing point.

WAR ITEMS.

War Exhibition.—In view of our incalculable indebtedness to the gallant Belgian nation, a War Exhibition has been organised to assist the funds of the Belgian Red Cross Anglo-Belgian Committee. It is designed to present in an interesting and instructive manner an idea of the extent to which science and industry are being utilised in every branch of the present gigantic struggle. There will be a magnificent 13,700 sq. ft. mural panoramic representation of Belgium. This portrays amongst other scenes the beauties of Brussels, Antwerp and its magnificent port, Bruges (the Venice of the North) with its many bridges, Ghent, Ostend and the Coast, Liége, Namur and the Valley of the Meuse, including the ill-fated Dinant, Louvain, Malines, Ypres, and Visé, the first town to fall temporarily under the iron heel of the barbaric Hun. Season tickets are being issued at £1 1s. each, carrying the privilege of the holder admitting a different friend at each visit if desired. It is hoped that a large application by the public who desire to help will be made for these season tickets, and it may be mentioned that they will be available on all the National and International Days which are being arranged throughout the season. The Exhibition comprises seven sections, No 4. of which will relate to science and industry as applied to war, including the latest scientific instruments used in connection with war. The Prince's Skating Club, Knightsbridge, S.W., has been selected as the most suitable place in which to hold the Exhibition. Offers of interesting War Trophies as loan exhibits, or assistance of every kind towards making the Exhibition the great success it deserves to be on account of its object, will be welcomed by the Hon. Organising Secretary, War Exhibition, London Chamber of Commerce, 97, Cannon Street, London, E.C.

Board of Trade Inquiries.—The B. of T. Commercial Intelligence Branch has issued list No. 22, to date May 22nd, of inquiries received by it for sources of supply of goods.

Commercial Travelling after the War.—At the annual conference of the United Kingdom Commercial Travellers' Association held in Manchester last week, Sir William Mather, of the firm of Messrs. Mather & Platt, Ltd., was elected president. He was unable to be present, but in the course of a letter which he wrote to the conference, Sir William said that after the war the education necessary for an efficient commercial traveller must be largely developed on the lines of cultivating the scientific and technical, as well as the literary branches of knowledge. A higher general intelligence and all-round capacity would be needed to improve Great Britain's position among the progressive nations of the world. Though they must at any cost crush the vain-glorious and infamous means which the German Government had adopted with the object of enabling Germany to become the autocrat of the world, they could not, nor did they desire to, prevent the people of that country from reaping in the future the results of their indomitable perseverance and extreme efficiency in every department of peaceful activity which their educational methods had created. We could not conquer to subjection the people of Germany as competitors in trade and industry, but we could command our due share of the fruits of knowledge and enterprise throughout the world, so that we might continually enjoy, if we developed continuously the high intelligence necessary, a pre-eminent place in the competition of intellect that would follow this world war. Touching on the cultivation of closer relationship with Russia, Sir William said that the study of the Russian and French languages would amply repay the commercial traveller.

Glasgow Tramway Recruiting.—Glasgow tramway officials are meeting with much success in recruiting for the various battalions raised by the T.C. Last week 400 men were enlisted for the 15th, 16th, and 18th Highland Light Infantry, the Royal Engineers and the Royal Field Artillery. The infantry corps are located at Gailes Camp and the artillery and engineers at Ayr. Depôt companies are being formed for the 15th and 16th H.L.I., the main bodies having gone to the South of England to complete training.

Anti-German Outbursts in South Africa.—Our Cape Town correspondent writes:—"As a protest against the sinking of the *Lusitania*, the employés of the Victoria Falls Power Co., at Brakpan, sent an ultimatum to the management stating that unless all Germans, naturalised or unnaturalised, were dismissed, they would strike.

"In the rioting at Johannesburg the offices of Siemens, Ltd., and of the A.E.G. Co. have been destroyed by fire. In Cape Town the hardware and electrical stores of Koch & Dixie were set on fire and all windows smashed; a considerable amount of stock was also damaged. Some damage was also done to the premises of Leemans Bros., electrical contractors, in mistake, the firm being Hollanders and not German."

British Industries Fair, 1916.—We are informed that in view of representations made by the exhibitors and buyers at the British Industries Fair, which was recently held in the Royal Agricultural Hall, the Board of Trade have decided to hold another Fair in London early next year.

Personal.—Mr. Arthur B. Crump, late of the staff of Messrs. Willans & Robinson, Ltd., of Rugby, has received a commission as lieutenant in the South African Heavy Artillery, and is on service in German South-West Africa. When at Rugby he was in the Howitzer Battery.

Mr. T. A. Nunwick, of Manchester, has received a cable from Madras, from his son, Midshipman A. C. Nunwick, late of H.M.S. *Triumph*, stating that he is safe and well. He has also received a telegram from the Admiralty to the same effect.

Mr. Haydn Harrison has been appointed lieutenant in the R.N.V.R., attached to H.M.S. *Vernon* for special work in connection with the Admiralty. This will, of course, necessitate his absence from town, but his business at 11, Victoria Street, will be carried on as usual.

The following appear in the *London Gazette* among the names of aliens to whom certificates of naturalisation have been granted during May, 1915:—

Myhre, Einar (Denmark), electrical engineer, residing at Blackheath.

Parshall, Horace Field (U.S.A.), consulting engineer.

Vasile (Vessel), George (Roumania), electrician, residing at Ferndale, Glam.

Mr. P. Grice, who has just been gazetted Second Lieutenant, is the second son of Mr. and Mrs. J. Grice, of Charnwood House, Rothley Plain, Leicestershire. After leaving the Leicester Technical School, he spent three years at Messrs. Siemens Bros. Dynamo Works, Stafford, prior to accepting a position with the Newcastle-on-Tyne Electric Supply Co., Ltd. After a stay of four years—during which time he was a member of the Newcastle Section of the Institution of Electrical Engineers, and gained an Institution premium for a paper read, Mr. Grice obtained an appointment with Messrs. A. Reyrolle & Co., of Hebburn-on-Tyne. When the war broke out, together with several friends he came to London and joined the Royal Engineers (Signal Co.).

Roll of Honour.—Private Robert Davies, of the 2nd East Lancashire Regiment, formerly in the employ of Messrs. Chas. Macintosh & Co., Manchester, has died at Boulogne from wounds received in the fighting at Ypres.

Private Tom Hayes, of Thornton, Fylde, who has been killed in the Gallipoli Peninsula, was formerly electrician at Rossall School.

Corporal John Albert Carroll, of the King's Own Royal Lancaster Regiment, Queen's Road, Harpurhey, Manchester, formerly employed by the National Telephone Co., Manchester, has been killed in action at Ypres.

The *Times* reports that Senior Engineer Stanley John Reed, who lost his life in the *Princess Irene*, received his engineering training at Barrow, and was an expert in turbines and submarines. He had received the Telford Medal of the Institution of Civil Engineers for a paper on turbines.

BUSINESS NOTES.

Consular Notes.—BRAZIL.—The *Diario Oficial* of March 2nd reports a new development of American enterprise in Brazil in the authorisation of the establishment of a branch in Rio de Janeiro of the National City Bank of New York. The American Government has recently been studying carefully the question of the effect on trade with South America of the nationality of the banks, and has determined as far as possible to develop American banking business with South America, largely with the view of facilitating commerce with that country.

URUGUAY.—The American Consul at Monte Video reports that the new president of the National Power Houses Board, Senor B. Lascoity, Usina Electrica de Monte Video, has given out an interview stating the intentions of the Government in regard to electric power in Uruguay. The object is to give good service to the public and to devote profits to improvement of the service and the reduction of rates. It is hoped to reduce the rate for small industries in Monte Video from 5½ to 4½ cents per KW.-hour, an advantage already enjoyed by the larger industries; those taking power on a larger scale get it for 2 cents. The board is also considering means to reduce the rates for poor people and for employés of the power house. The present tariff is 12 cents per KW.-hour, and a reduction of from 2 to 4 cents is anticipated. Light and power will be extended to the principal towns. La Paz and Las Pildras are about ready. At Pando and Tacuarembo the power houses now building will be finished in four or five months. The Government expects to purchase the Corporation-owned power houses, and is already negotiating for those at Paysandu, Rivera and San Jose. It is stated that part of the profits of the national electric light and power system will be applied to the construction of the national telephone lines, which will be underground in the capital city and aerial in the interior. Tenders will be called for to supply either an automatic or a manual system, and the kind of system will be decided upon after the bids are made. The line will cover a wide area, embracing the capital and contiguous departments. The total cost is placed at about £500,000. To effect all this the governmental power house (Usina Eléctrica de Monte Video) must be considerably improved. It is intended to increase its capacity with an alternating turbine of 8,000 KW. Another plan under consideration is to transform some of the boilers in order to burn crude petroleum, which is cheaper than coal and vacillates less in price.

There are two electric car lines in Monte Video—La Transatlántica, a German company, and the Sociedad Comercial, which is English. In addition, the Uruguayan Government operates a horse car line, the Tranvia del Norte. It has been decided to electrify this line, and a meeting of the directors will be held as soon as the President, who has been ill, can attend. Certain details will be decided upon and bids invited. It is estimated that about £300,000 will be spent for rails, cars, wires, &c.; in fact, everything will be purchased except equipment for a power house, which the Government already operates. The first work is to cover a line of about 10 miles, but will later be extended to twice that length. "The power house will necessarily be enlarged later, at which time there will be an opportunity to sell American machinery and equipment. The present machinery is of English make. The director from whom this information was obtained does not think it is worth while to send mail offers or catalogues. The only effective method is to send a representative who can close the deal in one or several lines. He should bring photographs or drawings and data to lay before the board, and be prepared to stay until the deal is completed. No further details can be had at present."

Catalogues and Lists.—MESSRS. OZONAIR, LTD., 96, Victoria Street, London, S.W.—Illustrated and priced leaflet describing their Ozonair domestic water steriliser.

MIDLAND ELECTRIC MANUFACTURING CO., LTD., Stafford Works, Rea Street South, Birmingham.—New catalogue (42 pp.) giving prices, brief particulars, and illustrations of their various "Mem" switchgear, including ironclad switches, switch and fuse units, supply panels, ironclad fuses and fuseboards, fuse carriers, tubular switches, open traction switches, accumulator switchboards, and other manufactures. The list contains a number of new lines, and an accompanying circular which refers to delays consequent upon war conditions, gives dates upon which delivery can be given of particular lines shown in the catalogue.

MESSRS. BROWN BROS., LTD., Great Eastern Street, London, E.C.—Leaflet giving tabulated prices of round polished silver steel in 13-in. lengths.

MESSRS. J. & W. B. SMITH, 15-23, Farringdon Road, London, E.C.—New illustrated price list (8 pages) of electric fans of ceiling, desk and bracket, ship and railway carriage types.

Lamp-Colouring Varnishes.—MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., announce that owing to the increase in the price of aniline dyes they have found it necessary to advance the price of lamp-colouring varnishes by 20 per cent. The price of Siemens's lamp obscurer, which is an etching fluid, is also advanced 20 per cent.

Battery Manufacture in Spain. — La Sociedad Fabrica Nacional de Accumuladores, S.A., is the name of a new company which has lately been formed in Madrid to establish works for the manufacture of accumulators in accordance with the patents taken out by D. R. Serrano and D. José Mendoza.

Book Notices.—*Micrometers.* By A. W. Marshall and G. Gantry. London: Percival Marshall & Co. Price 6d. net.—This little book will be found useful, not only by amateurs, for whom it was primarily intended, but also by engineering students, apprentices and others, who in these days of precision must be acquainted with the construction and use of refined instruments of measurement. All the appliances in common use appear to be included, and the treatment is lucid and interesting.

Every Boy's Book of Electricity (Percival Marshall, price 1d.) is a simple introduction to electrical apparatus and the uses of electricity, in the plainest language, and with clear illustrations. It should have a wide vogue amongst our budding Edisons.

"*Bulletin* de la Société Internationale des Electriciens." Vol. V, No. 42. May, 1915. Paris: Gauthier-Villars. Price 3 fr.

"Tait's Electrical Directory of Australia and New Zealand." 1915. Melbourne: *The Commonwealth Engineer.* Price 5s. 1d.

Journal of the Institution of Electrical Engineers. Vol. LIII, No. 249. June 1st. London: E. & F. N. Spon, Ltd. Price 3s. 6d.—This issue contains Sir John Snell's Address to the Students' Section, and the following papers: "Development of Main-Line Signalling on Railways," by W. C. Acfield, and "A Plea for Scientific and Technical Commissioners," by W. P. Digby.

"*Engineering* Directory of Advertisers." No. 60. April, 1915. London: "Engineering," Ltd.

"Science Abstracts." Sections A and B. Vol. XVIII, Part 5. May 28th, 1915. London: E. & F. N. Spon. Price 1s. 6d. each.

"*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXXI, Part I. May, 1915. Newcastle: The Institution. Price 5s.

Private Arrangements.—ATLAS ELECTRICAL CO., LTD., High Street, Charing Cross Road, London, W.C.—A meeting of the creditors was held on Tuesday at the offices of Messrs. Peter Thomas & Clark, solicitors, 53, Cannon Street, E.C. The statement of affairs presented showed liabilities of £670, all of which were due to trade creditors. The total assets were £714. From that amount had to be deducted £450 due on debentures, leaving net assets available for the creditors, subject to the costs of the receivership, of £263 16s. 4d. It was stated that the company was a private one and was formed in May, 1913, with a nominal capital of £100 divided into £1 shares. Debentures for £450 were issued for cash in November, 1913. When the company was formed only about 25 shares were subscribed for in cash. Recently creditors pressed, and the debenture-holders appointed a Receiver. The principal debenture-holder was Mrs. Clegg, the wife of Mr. W. H. Clegg, the managing director of the company, and that gentleman was appointed to act as the Receiver. After a short discussion, a resolution was passed in favour of an application being made to the Court for the appointment of Mr. G. Corfield to act as the liquidator in the voluntary winding up. The following are creditors:—

Grevener, J. & H...	£31	Soupham & Woods	£20
Siemens Bros. Dynamo Works	22	Pope's Electric Lamp Co. ..	133
Electrical Co.	20	Sceando Lamp Co., Ltd. ..	101
Gent & Co.	34	Yorkshire Cable Co.	30
Imperial United Lamp Co. ..	35	Marboro, Ltd.	11
Sanger, J.	16	Atlas Carbon & Battery Co. ..	11
United Incandescent Lamp Co.	30	Credenda Conduits Ltd... ..	11

W. T. CORNELL, LTD., electric light engineers, 4, Church Walk, Kensington, London, W.—A meeting of the creditors was held on Saturday, when the liquidator reported that the liabilities to the trade amounted to £210, while the assets were valued at £48. The company was registered on April 5th, 1914, with a nominal capital of £500 in £1 shares. The directors were Mrs. Cornell and her son. The former held 493 shares, while the remaining seven shares were held by the signatories. The company was formed to acquire the business previously carried on by the late Mr. W. T. Cornell. The principal creditors were the General Electric Co., whose claim amounted to £130, and at their wish the meeting was adjourned.

J. T. MAYFIELD, electrical engineer, 63, Cannon Street, London, E.C.—A meeting of the creditors was held on Monday, when a statement of affairs was presented showing liabilities of £605. The indebtedness to the trade was £535, and there was a partly secured cash creditor for £190. The business was originally carried on by the father, Mr. J. T. Mayfield, who died intestate in June, 1910. An arrangement was then entered into by which the debtor should take over the business and pay his mother an annuity of £200. The partly secured cash creditor was the debtor's mother, and her security consisted of an assignment of the book debts. After a short discussion, it was decided that a deed of assignment should be executed to Mr. G. E. Corfield, of Corfield & Cripwell, who was instructed to make a further investigation, and report to an adjourned meeting.

Prices Advance.—MESSRS. A. P. LUNDBERG & SONS announce that in consequence of further increases in the costs of labour and material, the net amounts shown on invoices will be subject to an increase of 15 per cent. until further notice, instead of 5 per cent. as hitherto.

MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., announce that owing to increased prices of raw material, they have found it necessary to advance the list prices of fittings and glassware by 10 per cent. as from June 1st.

Bankruptcy Proceedings. — C. WRAY, mechanical and electrical engineers, Bradford.—A supplemental dividend of 7½d. in the £ is payable to-day (June 4th) at the Official Receiver's office, 12, Duke Street, Bradford.

Liquidation. — COAST DEVELOPMENT CORPORATION, LTD.—This company is winding up voluntarily, with Messrs. A. F. Whinney and J. F. Stovell as liquidators.

Portland Cement Works for Queensland.—Owing to the shortage of German and Belgian supplies, a good deal of attention is being given to the manufacture of Portland cement in the Colonies and other places abroad where limestone, shale, or clay and coal can be obtained of suitable quality, and in sufficient quantities to make the manufacture likely to be successful and remunerative.

The Queensland Cement and Lime Co., Ltd., has now arranged to establish a works at Darra, near Brisbane. The plant is designed to produce about 40,000 tons of cement per annum. The complete contract for the supply and erection of the plant has been placed with Messrs. Noyes Bros. (Sydney), Ltd., engineers and contractors, who have had a large experience in connection with similar work in Australia.

The plant will be of the most modern description, and is all being obtained from British manufacturers. The grinding mills will be of the combination ball and tube mill types. The kiln will be 140 ft. long and 8 ft. diameter, and with the elevators, conveyors, slurry mixers, pumps, &c., will be electrically-driven, direct coupled wherever possible.

The motors are for three-phase, 50 cycles, 440 volts, and the works will be complete with its own electrical generating plant, including alternators, direct coupled to vertical high-speed engines, condensing plant, boilers, &c.

The general lay-out of the plant shows that it is expected that very soon the works will be duplicated, and later on further increased.

Bennis Contracts. — MESSRS. ED. BENNIS & CO., LTD., of Little Hulton, Bolton, inform us that something like 80 per cent. of the work on which they are at present engaged is in connection with War Office contracts. They have sent us an imposing list of other contracts recently placed, including the following :—

Rotherham Corporation Electricity Station.—Four sprinkler stokers and compressed air furnaces for 8-ft. diameter Lancashire boilers; also two pair of chain grates, 6 ft. 6 in. wide by 11 ft. 5 in. long. Repeat order.

Liverpool Corporation Electric Supply Department, Lister Drive Station. —Relinking two chain grates of another make, with the Bennis patent links.

Hastings Tramways Co., St. Leonards-on-Sea.—Relinking four chain grates of another make, each 4 ft. wide by 11 ft. 3 in. centres.

Fire Prevented.—The sensitiveness of electric fire alarms was well exemplified in a recent instance when the Fire Brigade was automatically called to a printing office in the City at 10.35 p.m. There was no fire, but the heat given off by a gas jet, which had been left burning in a confined space, and had already blackened some wood laths, had sufficed to actuate the alarm in time to prevent an outbreak. The system was installed by ASSOCIATED FIRE ALARMS, LTD.

Patent Application.—Mr. A. C. Hyde and the Vactite Wire Co., Ltd., have applied for restoration of Patent No. 17,817 of 1907 for "Improvements in making electrically conducting joints in metallic-filament incandescent electric lamps."

For Sale.—Offers are invited by the borough electrical engineer of Leigh (Lancs.), for the purchase of a boiler, 3,175 sq. ft. heating surface. MESSRS. P. HUDDLESTON & CO. will sell by auction a large quantity of electrical apparatus, including motors, cable, switches, telephones, &c., at Dalling Road, Hammersmith, W., on June 9th. Particulars are given in our advertisement pages to-day.

Trade Announcement.—MESSRS. FLETCHER'S ELECTRIC FITTINGS CO., LTD., electrical fittings makers, are vacating their premises at 30, Sutton Street, Holloway Head, Birmingham.

LIGHTING and POWER NOTES.

Aberdeen.—The Electricity Committee reports that the number of units of electricity generated last month showed an increase of 40,000 over the corresponding period of last year.—*Aberdeen Journal.*

Aylesbury.—E.L. SCHEME INAUGURATED.—The electricity works, constructed by the U.D.C., were opened on May 27th, the scheme being explained to the visitors by the resident engineer, Mr. W. H. Turnbull.

Bath.—The Diesel engine at the Corporation electricity works, which has been dismantled since early in 1914, is to be reassembled with the addition of certain improvements, at an estimated cost of £150, and will be running in about 10 weeks' time.

Birmingham. — YEAR'S WORKING. — The annual accounts of the Corporation Electricity Supply Committee, for the year ended March 31st, 1915, show that the total number of units sold as compared with the previous year was as follows :—

	1915.	1914.
Low-tension—		
Lighting	8,726,306	8,341,027
Power...	21,460,141	19,192,304
High-tension	28,536,161	22,193,274
Tramway supply	24,186,574	24,040,573
Total ...	82,909,182	73,767,178

The total value of units sold was £379,625, compared with £346,561 in 1914. The output for lighting and power, excluding tramways, shows a substantial increase, the units sold being 18·1 per cent. higher than in the previous year. The money value of this supply shows an increase of 14·1 per cent. The output for tramway supply shows an increase of 0·6 per cent. The gross profit on the undertaking was £192,376, and after meeting all charges for interest, &c., there remained a balance of £60,385, of which £25,000 has been carried to renewals fund, leaving £35,385, which it is proposed to carry to the credit of the borough rate. This is approximately £10,250 more than the contribution of the previous year.—*Birmingham Daily Post.*

Bispham.—LOAN SANCTION.—The U.D.C. has received from the L.G.B. sanction to a loan of £3,586 for E.L. purposes.

Blackburn.—NEW SCHEME DEFERRED.—The scheme for the new generating station at Whitebirk has had to be deferred owing to the refusal of the Treasury and L.G.B. to sanction the necessary loan.

Bolton.—INCREASED PRICES.—In view of the increased cost of generation, due to the price of fuel, the Electricity Committee has decided that, from May 28th, current for lighting be charged at 4d. per unit instead of 3·5d. For power purposes the charge will be increased over the present prices by about 10 per cent. For the first time for a number of years, no grant is being made to the relief of the rates.

Bournemouth.—REDUCED E.L. CHARGES.—According to a local paper, the Bournemouth, Poole and District Electric Supply Co. is making a reduction of ½d. per unit in the price of current. This is equivalent to an 8 per cent. reduction.

Bury.—RATE RELIEF.—Of the profit of £2,038 on the electricity undertaking for the past year, £1,000 has been allocated towards the relief of the rates, and the balance has been placed to reserve fund.

Cape Province.—The ratepayers of Beaufort West have passed a resolution urging the Municipal Council to proceed at once with the electric lighting scheme, sanctioned eight months ago, but postposed owing to the war.

Carshalton.—REFUSE DESTRUCTOR.—The U.D.C. has decided not to join with other local authorities in the provision of a refuse destructor, it being considered that the power from a destructor cannot be utilised for other remunerative purposes.

Continental Notes.—SPAIN.—A new company has been formed in Barcelona with the title La Sociedad Central Electrica de Villarrodona to establish a small central station for the supply of electrical energy for lighting and power purposes in the town and district of Villarrodona.

FRANCE.—Our contemporary, the *Gas World*, quoting a French paper, refers to the damage done to Rheims gas and electricity works. It appears that the electricity works were struck by two shells, damaging the machinery, and that both underground and overhead mains have been badly cut about. The damage to the gasworks was much more extensive, but by prompt action serious results appear to have been avoided.

Cuba.—The following persons have been granted permission to install electric power and lighting plant:—Senor Wenceslao Sánchez Cifuentes, at San José de los Ramos, Province of Matanzas; Senores Pérez y Hno., at Nueva Gerona, Isle of Pines; Senor Lino Rodriguez, at Florida, Province of Camaguey; and Senores Abreu y Hno., at Florida. The *Gaceta*, which contains particulars regarding the installations to be carried out, may be consulted at the Commercial Intelligence Branch of the Board of Trade.

Darlington.—INCREASED PRICES.—In view of the high price of coal, and to meet the additional charges for war bonuses to employés, the Electricity Committee of the T.C. has increased the price of current for lighting by ½d., and for power by ⅛d. per unit.

Derby.—LOAN SANCTION.—The T.C. has received the sanction of the L.G.B. to a loan of £12,550 for E.L. purposes. The E.L. Committee has recommended the Council to increase the charges for current by 10 per cent. in consequence of the high price of coal.

Dublin.—YEAR'S WORKING.—The report of the Electricity Committee for the year ended March 31st last shows a net profit of £748 on the year's working, as compared with an estimated profit of £9,024. The falling off in consumption during the year was 284,000 units, representing £8,687. The decrease in the working expenses as compared with the estimates amounted to £2,753, but capital charges increased by £2,443. For the current year the capital debt charges are estimated at £55,653. If the present rates are retained the Committee estimates a deficit on the current year of, approximately, £21,334, and it is suggested that the deficit should be spread over more than one year by utilising the small reserve of working capital, which, with the slight profit of the year just closed, should amount to £9,600, and to make an increased charge of ½d. on the lighting rates and ¼d. per unit on the power rates, the additional charge to be borne for two years.

Erith.—BULK SUPPLY. — The U.D.C. has decided, subject to the approval of the B. of T., to afford a bulk supply of current to the West Kent Electric Co., for distribution to houses being erected in Colyer's Lane.

Glasgow.—It is considered that the Electricity Committee will be faced with the necessity of increasing the rates both for lighting and for power by 10 per cent., owing to the increased cost of coal, &c.

Haslingden.—REVISED PRICES.—The Corporation has decided that the charge for electricity supplied to places of worship, workshops, offices, banks, warehouses, and to other short-hour users, be reduced from 5d. per unit to 4d. per unit from July 1st next. In future 2½ per cent. discount is to be allowed on accounts for electricity for heating purposes, provided payment is made within 14 days.

Hebden Bridge.—In order to encourage the day load, the Electricity Committee has introduced a new scale of discounts, varying from 5 to 62½ per cent., according to quantity taken. If the total consumption exceeds 100,000 units a year, the excess units will be charged at ½d. per unit without discount.

Hereford.—YEAR'S WORKING.—During the year ended March 25th, 1915, the Corporation Electricity Department sold 1,303,800 units, as compared with 850,011 in the previous year, showing a phenomenal increase of 453,789 units, or 53 per cent. The power units sold numbered 1,039,114; the maximum load reached 585 KW., and the load factor 25·44 per cent. The generation cost per unit sold was ·651d., as against ·771d., and the total cost 1·52d. as against 2d. per unit. The average price obtained was 1·512d. per unit, this showing a small deficit (£59) on the year's working, as compared with a surplus of £105 in the previous year. The total revenue was £8,215, and the gross profit was £3,605. The report of Mr. Kerr, the city electrical engineer, mentions that eight months of war had decreased the lighting revenue by £300; a deficiency of condensing water—since remedied—is also estimated to have made a difference of £300 in production costs, and in addition the rising price of fuel has adversely affected the costs. Over 120 consumers were added during the year, and the consumption per head of population is now 56·73 units.

Owing to the increased cost of production and the decreased consumption of current, the Electricity Committee has decided to increase the charges for current, except where prices are fixed by contract, by 10 per cent. as from June 1st.

Holmfirth.—E.L. SCHEME.—The erection of the generating station for the E.L. scheme has been commenced by Mr. R. Turner; the poles for the overhead lines are being put up by Messrs. Broadbent.

India.—ELECTRICAL MINING REGULATIONS.—According to *Indian Engineering*, the question of arranging for a more systematic inspection of electrical installations in coal mines in India is at present under the consideration of the Government of India. At present inspections of electrical machinery, whether installed in mines or elsewhere, are made by Inspectors under the Electricity Act. In order to make them more thorough and effective, an Inspector under the Electricity Act will probably be required to reside permanently in the principal coal-mines area, probably at Dhanbaid, and to devote practically all his time to inspections of installations at the mines.

London.—At the recent conference between the County Council and municipal electricity suppliers in connection with the London electricity supply, it was pointed out to the L.C.C. that to ensure any Bill it might wish to bring in being successful, it would be necessary to consult the B.C.s before the Bill was formulated and not after it was drawn up, so that the B.C.'s suggestions might be embodied. According to the *East London Advertiser*, the L.C.C. has agreed to meet the Councils concerned on the question.

Mansfield.—The T.C. has decided not to increase the generating plant at the electricity works at the present time on account of circumstances arising out of the war.

Nuneaton.—ELECTRIC COOKING, STREET LIGHTING, &C.—The T.C. has decided to purchase, at a cost of not exceeding £40, suitable electric cooking apparatus, and to grant a war bonus to the electricity works staff. Provided the order for conversion is placed at once by the Highways Department, the Electricity Committee has decided to take over and light 97 street gas lamps on the route of existing mains in November next.

There was a net profit of £878 on the working of the electricity undertaking during the year ended March 31st last.

Salford.—PRICE INCREASE.—The Electricity Committee has decided that the price of energy for lighting and power be increased 7½ per cent. from July 1st next, except as regards that supplied to the tramways department, or under special agreements for unexpired periods, entered into prior to October 1st last.

Sidmouth.—REFUSE DESTRUCTOR.—The question of providing a refuse destructor for the urban district has been deferred, owing to the refusal of the L.G.B. to sanction a loan for the work.

Southampton.—ELECTRIC VEHICLES, LOANS, &C.—In view of the successful operation of the electric van which was put into service recently, the Electricity Committee has decided to exercise its option on an additional chassis, and equip the same for use on the mains. At the outbreak of war the Government commandeered the 500-KW. rotary converter on order from the British Thomson-Houston Co. In view of the fact that since the service of tramcars has been increased, the electrical engineer now supplies the cars from the 1,000-KW. sets, the company was approached as to the cost of a 750-KW. set arranged so that the tramways could be supplied from it when required. It has now been decided to purchase the machine at £1,909, and to apply to the L.G.B. for sanction to borrow the cost. In reply to the Council's application for further sanction to loans of £8,000 and £6,000 for mains and services, the L.G.B. has intimated that it is not prepared to give its sanction unless in respect of extensions to factories engaged in the making of munitions.

Southport.—PRICE INCREASE.—An advance of 10 per cent. on the price of electricity to consumers for all purposes is to take effect from June 24th next. Following the lead of Southport, the Birkdale District Electric Supply Co., Ltd., which supplies the Birkdale area, has announced an increase in the price of electricity of 10 per cent. to commence on June 30th.

Spenborough.—PRICE INCREASE.—A new scale of the electrical charges has been prepared in connection with the Council's electricity undertaking, which will operate from July 1st, and provides for (*a*) the abolition of a 10 per cent. addition on the net amount of consumers' accounts, which came into force on January 1st, 1913; (*b*) that charges for current for heating and power be 2½d. per unit on a minimum consumption of 150 units per quarter per H.P. of demand, and 1½d. per unit above such minimum, with sliding scale discount for payment within a month of demand; and (*c*) that the charge for lighting current be 4½d. per unit, with a discount of 5 per cent. for payment within a month of demand.

Stalybridge.—PROPOSED LOAN.—The Joint Tramways and Electricity Board has decided to apply to the L.G.B. for sanction to borrow £4,000 for transformers and mains for munition factories.

L.G.B. sanction has been received to the borrowing of £12,921, and mains extensions are to be carried out.

Walthamstow.—INCREASED PRICES.—The Lighting Committee has decided to increase, as from the June quarter, the prices charged for current by 15 per cent., except in the case of contracts. As regards prepayment meters, it is proposed to charge the consumer an equivalent of 15 per cent. upon the sum taken from the meter. The engineer is to negotiate with those consumers who have period contracts, with a view to their paying the increased price without prejudice to the terms of the contract.

West Bromwich.—YEAR'S WORKING.—The accounts of the electricity undertaking for the year ended March 31st last show a net profit of £878, which is to be carried to net revenue appropriation account. The total income of the undertaking was £20,252, or an increase of £1,938 as compared with the previous 12 months. The receipts from the sale of current show an increase of £1,824. The L.G.B. has sanctioned the borrowing of £3,300 for mains and £3,444 for new boiler, pipework, feed pump, transformer, switchgear, regulator and cable connections. Application is to be made for the consent of the B. of T. to put up another overhead main in order to give a larger supply of current to the premises of Messrs. J. Brockhouse & Co., Ltd.

Wharfedale.—PROPOSED E.L. SCHEME.—The conference of representatives of various local authorities to consider the possibility of a joint scheme of electric supply, in view of the withdrawal of the Yorkshire Electric Power Co.'s Bill, was held last week at Yeadon. Representatives were present from the Councils of Yeadon, Rawdon, Guiseley, Otley, Burley and Wharfedale Rural Councils. A resolution was adopted in favour of the production of the current inside the area covered by the local authorities represented, and a committee was appointed to obtain information as to the cost of purchasing energy in bulk from every available company or Corporation within reach, and also as to the best means and the cost of obtaining a combined provisional order.

Worcester.—WAR BONUSES.—The Electricity Committee has recommended the T.C. to grant a war bonus of 2s. 6d. per week to certain members of the electricity works staff, and 2s. per week to others.

TRAMWAY and RAILWAY NOTES.

Australia.—A very large expenditure is contemplated in connection with the electric tramway extension for the eastern suburbs of Melbourne. Two lines already in hand involve an estimated expenditure of £215,000, and other lines are in contemplation involving a further expenditure of £148,500.—*Melbourne Age.*

Birmingham.—YEAR'S WORKING.—The annual accounts of the Corporation tramways department for the year ended March 31st last show a total revenue of £647,014, as against £635,471 for 1914. Working expenses amounted to £473,879, as compared with £445,507 in the previous year, leaving a gross balance of £173,135,

and after paying interest and sinking fund charges, the net surplus for the year was £47,596, of which £17,596 was placed to reserve fund, the balance, £30,000, being transferred to the credit of the borough rate account. The total car-miles run were 14,232,902; the average traffic revenue per car-mile 10·793d., as against 10·563d.; the average working expenses per car-mile 7·991d., as against 7·494d. in 1914; and the percentage of working expenses to receipts 73 as against 70 per cent. in the previous year. It is believed that the loss in traffic due to the war was between £40,000 and £50,000.—*Birmingham Daily Post.*

Bolton.—Strike.—A settlement of the tramway strike was arrived at on Tuesday, and the car service was resumed on Wednesday, after three days of idleness. The men returned to work in consequence of an offer made by the Committee that no notice would be put up requiring them to work proposed extra cars; this overtime will be worked voluntarily. A further promise was made to the men that other grievances would be considered.

Chester.—The Tramways Committee has received a letter from Capt. Gosset, stating that it was quite possible that sanction could be obtained for wounded soldiers, who were unable to return to the Front, to accept positions as tram conductors, and so relieve those eligible for enlisting. The Committee has agreed to employ such men as are capable of doing the work, as vacancies occur.

Coventry.—Female Labour.—Women conductors are to be employed on the less frequented tramway routes.—*Birmingham Daily Post.*

Glasgow.—Year's Working.—The tramway department's financial year closed on May 31st, and it is stated the net receipts will reach £1,070,353, or about £8,000 below the record total of last year. The number of passengers carried was about 300,000 less, though this is looked upon lightly, as last week, for instance, the number of tickets issued reached the remarkable figure of 7,039,490. This represents more than the total population of the city patronising the cars daily.

Hull.—Year's Working.—A net profit of £14,574 was made on the tramways for the year ended March 31st last; £10,000 of this has been allocated towards relief of the rates, and a sum of £6,076 has been carried to reserve fund.

London.—L.C.C. Tramway Strike.—The joint executive of the two Tramwaymen's Unions decided late on Monday night to recommend all L.C.C. tramway employés who are above military age to return to work.

A notice was issued on Monday by the Council's tramway manager that since the majority of the men above Army age have returned to work, although men who are eligible for service in the Forces will not be taken back, those who enlist will receive favourable consideration for reinstatement, as far as may be possible, after the war; and any man of military age unable to enlist may appeal to the chief officer and state his reasons, and he will consider whether any special circumstances allow an exception to be made in his case.

The M.E.T. Co.'s employés have all returned to work, the company having made no stipulation in regard to enlistment.

Newcastle-on-Tyne.—Female Labour.—At a meeting of the Tramways Committee on May 26th, the general manager reported that since the last meeting 48 women conductors had been trained, 24 were in full charge of cars, and the rest were in training on cars. Their employment had been an unqualified success, and had surpassed all anticipations. Applications for further women conductors were desired. The Committee decided to abolish ½d. workmen's fares, the minimum fare to be 1d.

Ramsbottom.—Railless Traction.—The first of the new railless cars, which has been built on stronger lines than the earlier ones, was delivered last week, and a trial run was stated to be satisfactory. The chassis is heavier, the wheels larger in diameter and provided with wider tires, while more flexible springs are fitted. Another car is on order, and the older cars are to be altered to conform with the new design.

Salford.—Female Labour.—The women who have been training as tramway conductors are to be on duty about 5½ hours daily (Sundays excepted), to work "emergency cars" in the mornings and evenings, when people are going to or from business. Mr. G. W. Holford, general manager, has addressed a notice to the men explaining the circumstances under which the women are being employed and asking the men to assist the newcomers as far as possible. A notice has also been issued in which the Tramways Committee appeals for the kind co-operation and consideration of the travelling public under the new conditions.

Stalybridge. — The Stalybridge, Hyde, Mossley and Dukinfield Joint Tramways and Electricity Board, on May 26th, sealed precepts on the four Corporations amounting in the aggregate to £7,000, being the amount of the deficiency in the net revenue of the Board to March 31st last.

Sunderland.—Year's Working.—During the past year the Corporation tramways earned a total revenue of £75,615; the total working expenses were £41,549, and the amount carried to net revenue account £34,066. Interest on capital absorbed £6,463; repayment of loans, £10,374; renewals fund, £9,602, and £5,000 was paid to the borough fund in aid of the rates. The reserve and renewals fund, which stood at £39,508 on March 31st, 1914, is now increased to £45,044.

U.S.A.—Suburban Railway Electrification.—The report of the engineer of the Wisconsin Railroad Commission, following an investigation of transportation facilities in the metropolitan district of Boston, recommends the electrification of the following lines centring in that city, which the Public Service Commission promises to consider with a view to their gradual conversion:—The Saugus and Medford branches of the Boston and Maine Railroad; the West Roxbury branch of the New Haven, and the Newton Circuit of the Boston and Albany Line. These are steam-operated at the present time, and it is proposed to reconstruct them by the laying of parallel track for local trains which would be run from the termini of the Boston Elevated Railway's present tunnels and elevated structures. The scheme contemplates the creation of three main routes intersecting at the centre of the branch; about $15,000,000 would be required.—*Electrical Review and Western Electrician.*

Norfolk and Western Electrification.—According to the *Railway Gazette*, this is the first line where the high-power electric locomotive has superseded the Mallet compound steam locomotive. The line electrified is in the Pocahontas coalfield, about 35 miles in length, and the traffic consists principally of coal. This is handled under closely competitive conditions, and a very large volume has therefore to be moved in order to make the traffic profitable. At present the amount carried daily is from 40,000 to 60,000 tons, and it is conveyed in trains weighing about 3,250 tons, consisting of steel hopper cars of 100 tons capacity carried on six-wheel bogies. There are long and heavy grades, rising 1 in 75 and 1 in 100, and a long 1 in 50 down grade. Hitherto, three Mallet compounds have been required, and the average speed has been 7 m.p.h., but with the new electric locomotives, the motors of which, during acceleration, develop as much as 11,000 h.p., and while running at regular speed on the up grade a continuous output of 8,000 h.p., take the trains at an average speed of 14 m.p.h. In view of the serious financial strain through which the railways of the United States are now passing, and the fact that no railway would at present undertake electrification unless the prospects were very reassuring, the work now being done on the Norfolk & Western, and on the Chicago, Milwaukee & St. Paul, is very significant.

West Bromwich.—Year's Working.—The net profit of the Corporation tramways last year was £192, which is to be carried forward. On the other hand, on the motor-'buses there was a net deficiency of £135, which will be a charge on the borough fund during the current year.

York.—Tramway Extension.—The L.G.B. has sanctioned the proposed extension of the tramways from Nessgate to Hull Road.

TELEGRAPH and TELEPHONE NOTES.

A Telegraph Spy.—It is reported that the parish priest of Caporetto, an Austrian village, has been court-martialled and shot by the Italians for treasonably communicating with the Austrians by means of a secret telegraphic apparatus.

Argentina.—It is announced at Buenos Ayres that telegrams for Germany and Austria must in future be sent by way of the U.S. wireless station at Sayville.—*Journal Télégraphique.*

New Cable.—The Greek Ministry of Ways and Communications has decided to connect the Epirus with the Isle of Corfu by a submarine cable *viâ* Santiquaranta. — *Journal Télégraphique.*

North Sea Cable.—It is reported that Great Britain has given the Norwegian Government a guarantee that she will respect the Great Northern Telegraph Co.'s steamers while they are repairing the Anglo-Norwegian cables. Norway has asked Germany to give a similar guarantee, but no reply has been received.

Panama Canal.—The U.S.A. Government is building three steel towers 198 m. high near the Canal, to carry the antennæ for the Panama wireless station. The towers measure 45 m. wide at the base and 3 m. at the top, and will weigh about 1,000 tons.—*Journal Télégraphique.*

Straits Settlements.—The American Consul at Singapore reports that a permanent wireless station at Singapore has recently been erected to be controlled by the Government. It was anticipated that the plant would be in operation by the middle of April. The apparatus is a complete Marconi 5-kw. outfit, having a range of 400 miles, which can be exceeded under favourable conditions. The towers are 250 ft. high, and the total cost is estimated at about £23,000. At the outbreak of war a temporary wireless station was erected on the top of a building in the centre of the city, but it is not a high-power station, and has been maintained for the Naval Intelligence Bureau. It is announced in the Government *Gazette* of the Federated Malay States that 10 acres have been acquired in Penang and Butterworth for a wireless telegraph station.

Uruguay.—Dr. Enrique Wilson, on behalf of a North American syndicate, has applied to the Government for permission to establish a powerful wireless telegraph station, with which Uruguay would be able to communicate directly with Panama and New York, and by means of these stations, with Europe.—*Review of River Plate.*

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdeen.—Corporation Electricity Works. One year's supply of small steam coal. Mr. J. A. Ball, City Electrical Engineer.

Australia.—Melbourne.—July 14th. Victorian Railway Commissioners. Supply of 60,000 flame arc carbons for use in Ganz flame arc lamps (Contract 28,811).—*Australian Mining Standard.*

Victorian Railways. July 14th. Aluminium feeder, insulators, anchoring clamps, &c., for the St. Kilda-Brighton electric street railway. Contract No. 28,817. Particulars at Contractor's Room, Spencer Street, Melbourne.

August 11th. One 1,000-kw. d.c. generator complete, liquid starter, &c., for City Council. See "Official Notices" to-day.

Adelaide.—July 14th. Galvanised-iron wire, for P.M.G.'s Department. See "Official Notices" to-day.

Sydney.—July 12th. Metropolitan Board of Water Supply and Sewerage. Two steam turbines and condensers at Ryde pumping station, for the Chatswood pumping plant. Secretary, 341, Pitt Street, Sydney.

July 19th. Council. Meters for the Electric Light Department, Town Hall. Specification 10s. 6d.

July 19th. Council. Maximum-demand indicators. Specification (10s. 6d.) from Electric Light Department.

July 19th. Municipal Council. One or two 12,000-kw. turbo-alternators (Contract No. 363).* A copy of the specification can be obtained from the City Electrical Engineer, Sydney.

July 19th. Steel towers for 33,000-volt transmission line. Specification (10s. 6d.) at E.L. Department, Town Hall.

July 21st. N.S.W. Government Railways and Tramways Department. One 250-k.v.a. turbo-generator.*

Perth.—July 7th. Deputy P.M.G. 31,000 porcelain or alternatively stoneware insulators (Schedule 432 W.A.).*

Specifications for the items marked * can be seen at the B. of T. Commercial Intelligence Branch in London.

Birkenhead.—June 10th. Rough slack (washed and unwashed) and small coal (washed and unwashed) for the electricity stations for six or twelve months. Borough Electrical Engineer.

Bridlington.—2,000 tons of coal, for the Corporation electricity works. Mr. A. J. Beckett, Electrical Engineer.

Cleckheaton.—June 9th. Slack coal (3,000 tons) for the Spenborough U.D.C. electricity works. Mr. J. H. Linfield, Clerk, Town Hall.

Dublin.—June 7th. Electric passenger lift for Irish United Assurance Society. See "Official Notices" May 28th.

Eccles.—June 9th. Corporation. Installation of the electric light at the Anson Street Council Schools, Winton. Forms of tender (10s.) from Mr. E. Parkes, Town Clerk, Town Hall.

Edinburgh.—June 21st. Two 5,000-kw. turbo-alternators and condensing plant, for Portobello supply station. See "Official Notices" May 21st.

Glasgow.—June 7th. The Trustees of the Clyde Navigation invite tenders for a year's supply of electrical stores. Mr. T. R. Mackenzie, General Secretory and Manager, 16, Robertson Street.

Grays.—June 10th. U.D.C. Six or twelve months' supply of Griff, Babbington or Stockingford hard steam coal for the electricity station. Electrical Engineer, Grays Thurrock U.D.C.

Kirkcaldy.—June 14th. Corporation. 100 half-watt 1,000-c.p. lamps and lanterns for street lighting. See "Official Notices" May 28th.

London.—L.C.C.—June 4th. Installation, 260 wiring points, 345 lights, also electric bells, at the County Secondary School, South Hackney. See "Official Notices" May 21st.

St. Pancras.—June 14th. Corporation. Twelve months' supply of Welsh and steam coal for the electricity stations and baths.

West Ham.—June 14th. Installation of lighting and water-heating apparatus at Knox Road Special School, for Education Committee. See "Official Notices" May 28th.

Manchester.—June 16th. 40-kw. steam dynamo for Cottage Homes, Styal, for Manchester Union. See "Official Notices" to-day.

Rangoon.—August 11th. Installation of a system of fire-alarms, for the municipality. Specification (10s.) from Messrs. Ogilvy, Gillanders & Co., 67, Cornhill, E.C.

Redditch.—June 14th. H.T. three-phase switchboard. See "Official Notices" May 28th

Rhondda.—June 4th. U.D.C. Water-storage tank (30,000 gallons), for Porth electricity works. See "Official Notices" May 28th.

Tasmania.—Launceston.—July 26th. Sub-station equipment. Section I, Converter machine, switchgear, &c.; Section II, Underground feeder cable. Specification (21s.) from the City Electrical Engineer, Town Hall.

Hobart.—July 5th. Lead-covered telephone cables; glassware and other material for batteries; telephone instruments, &c., for P.M.G.'s Department. See "Official Notices" May 28th.

CLOSED.

Bridlington.—The Electricity Committee recommends the acceptance of the tender of the New Destructor Co., Ltd., at £6,332, for a refuse destructor on a site adjoining the electricity works.

Buxton.—The U.D.C. has accepted the tender of Messrs. Day & Ferguson for 2,000 tons of Pilsley hard slack coal for the electricity works.

Derby.—The T.C. has sealed a contract with the Derby Kilburn Colliery Co., Ltd., for coal for the electricity works.

Dublin.—The Corporation Committee of Supplies has recommended the acceptance of the tender of Messrs. J. McKelin and Co., for 12 months' supply of Scotch steam nuts, at 25s. 11d. per ton, for the electricity generating station.

Hammersmith.—The Electricity Committee reports that for the annual supply of box frames, covers, boxes, &c., Messrs. W. Lucy & Co., the second lowest tenderers, have intimated that they would require an additional 7½ per cent. on the prices tendered by them. In view of this increase and that the requirements of the department will be less than was anticipated, the Committee recommends the purchase of these items in the open market as favourable opportunities occur. The Committee reports the purchase of 50 tons of Babbington 2-in. slack coal, at 19s. 6d. per ton.

Haslingden.—The Tramways and Electricity Committee has accepted the tender of Mr. J. Milne, for petrol required during the period ending March 31st next.

Leyton.—The U.D.C. has entered into contracts with the Electrical Apparatus Co., Ltd., the British Thomson-Houston Co., Ltd., and the Reason Manufacturing Co., Ltd., for ordinary meters, and with the B.I. and Helsby Cables, Ltd., for slot meters, for a period of twelve months.

Manchester.—The Engineering Sectional Committee of the Education Committee has approved the renewal of certain plates in the Tudor storage battery, at £250.

The Education Committee has accepted the tender of Messrs. R. Seddon and Sons for installation of electric light at the new Islington School Clinic, and the tender of Messrs. R. O'Brien & Co. for a telephone at Alder House.

The following tenders have been accepted by the Electricity Committee:—

Three 1,900-k.v.a. static transformers.—British Westinghouse Co.
Cable.—B.I. & Helsby Cables, Ltd.
Purchase of scrap copper and scrap cable.—B.I. & Helsby Cables, Ltd.

The Tramways Committee has accepted the tender of Messrs. Isaac Bentley & Co., Ltd., for linseed oil.

Meter Contracts.—Messrs. Ferranti, Ltd., have secured a contract from Glasgow Corporation for the supply of continuous-current electricity meters for the year ending May 31st, 1916.

Messrs. Chamberlain & Hookham, Ltd., have received contracts for meters for the coming year from Glasgow and Falkirk.

The Hornsey B.C. has placed a contract with the British Thomson-Houston Co., Ltd., for their direct-current ampere-hour meters for 12 months.

New Zealand.—Whangarei.—For electric wiring and the installation of meters for the B.C. the following tenders were received:—

National Electrical and Engineering Co., Ltd. ..	(accepted) £7,346
A. & T. Burt	8,114
Turnbull & Jones	8,287

—*New Zealand Shipping and Commerce.*

Salford.—The Electricity Committee has accepted the following tenders:—

H.T. cubicle and control panel, £371.—British Westinghouse Co.
Wet air filter, £327.—Heenan & Froude, Ltd.
Transformer, £160.—Ferranti, Ltd.
Purchase of scrap copper, £154 (approx.).—B.I. and Helsby Cables, Ltd.

South Africa.—The Johannesburg Municipality has accepted the tender of the Telegraph Manufacturing Co. for five miles of trolley wire, at £99 15s. per mile.—*S. African Mining Journal.*

FORTHCOMING EVENTS.

Association of Mining Electrical Engineers (Notts. and Derbyshire Branch).—Saturday, June 5th. At 3.30 p.m. At University College, Nottingham. Paper on "Experiences with Electrical Plant," by Mr. A. Smellie.

Royal Institution of Great Britain.—Monday, June 7th. At 5 p.m. At Albemarle Street, W. General Meeting.

Institution of Mining Engineers.—Thursday, June 10th. At 11 a.m. In the rooms of the Geological Society, Burlington House, Piccadilly, W. General Meeting.

Friday, June 11th. Visit colliery sinkings near Coventry.

North of England Institute of Mining and Mechanical Engineers.—Saturday, June 12th. At 2 p.m. At Newcastle-on-Tyne. General Meeting.

Salford Technical and Engineering Association.—Saturday, June 12th. Visit. Manchester Corporation Electricity Works, Stuart Street Power Station.

NOTES.

The Electrical Future of Belgium.—With reference to our leading article on this subject and the full report of a paper by M. Steylaers, we have pleasure in publishing the following letter:—

"Sir,—Referring to our letter dated 17th ult., we are now in a position to inform you that we intend to convoke a new meeting between the Belgian and English manufacturers within two or three weeks. We will inform you the exact date within a few days. The Belgian Committee for Trade with the Allies have put their rooms at our disposal in 43, Shoe Lane. Will you be in a position to induce the English manufacturers to attend this meeting, which seems more necessary than ever to begin to talk about taking energetic measures towards the production of our future business against German trade?

"I do not know whether you are fully aware of what is happening at the present time in Germany with regard to preparing for the economic struggle with the Allies after the war. It will be sufficient to state that at the present time already hundreds and thousands of small labels are being made in Germany in electrotype with the mention, 'Not made in Germany.' Do you see what this means? Are you fully aware that Germany after the war is going to conduct, through neutrals and even through many of our own countrymen, a campaign against her own goods, and is going to brand her own goods with her own labels, 'Not made in Germany'?

"This may be something like a false signature, but we are already getting accustomed to such mean acts, which would be reproved by the honest tradesman. I will tell you something more. Are you aware that already now active steps are being taken by German business men with neutrals, and also with Belgian and English people, to induce them to act after the war on behalf of German trade, as what we call in French *Prête Nom?* This means that:

(1) The Germans realise perfectly that they have absolutely lost the war;

(2) That they have absolutely lost the goodwill;

(3) That they consider the end of the war to be much nearer than many people think, a fact which they know better than ourselves, because they can calculate better what is their real power and resistance on the economic point. All these facts stated above are proved by personal witnesses actually in Germany who are studying these economic sides to the very foundations.—Yours faithfully,

"R. STEYLAERS.

"7, Idol Lane, London, E.C., *June 1st*, 1915."

The Latest "Magnetic" Invention.—One of the most bare-faced devices to ensnare the credulous that we have ever met with has recently been brought to our notice by the city electrical engineer of Londonderry, Mr. R. V. Macrory, who laments the fact "that hands are now employed in producing such rubbish at the present time, when so much useful work is being delayed." It consists of two thin wires, of iron and some other metal, about 7 in. long, twisted and soldered together at one end like the letter Y, with the tail of the Y coiled in the form of a small helix. This device is called the "sun-ray magnet," and is described in a cleverly-written leaflet ("No. 1, Vol. I") as a "Great scientific gardening discovery," a "simplified 'wireless' method of electrifying the soil and its plant life with 'Sun-Ray Magnets.'" The leaflet is ornamented with quotations from Swift and Emerson, and on the last page, with consummate impudence, refers to our articles on the uses of electricity in agriculture and horticulture. The two straddled legs of the "magnet" are to be pushed into the soil a few inches from the plant, in a position "that is most open to the sun and the atmospheric electric currents." If the soil is hard, it should be loosened all round the plant—a process which, it will be noticed, is itself likely to aid plant growth, though the improvement will, by the superficial, be attributed to the use of the "magnet." Careful instructions are also given to water the plant regularly, on the score that "a plant aided by a 'Sun-Ray Magnet' is able to absorb more moisture," and we are artlessly informed that "in continuously dry soil the Electrically-stimulated plant does, perhaps, less well than without Electricity"! As a proof that the "Magnet" possesses electrical properties, the two ends are shown connected to a sensitive galvanometer, while the soldered junction *is held between the finger and thumb*. Naturally, the thermoelectric current thus produced deflects the needle, and the doubter is convinced. But it is claimed that in use "the 'Sun-Ray Magnets' act as 'conductors' of the Infinite Electrical Currents of the atmosphere."

We will not follow the leaflet through its ingenious manipulations of genuine experimental facts on the effect of electricity on the growth of plants, its clever illustrations of plants alleged to be grown with and without the "sun-ray magnet," its specious arguments, undoubtedly compiled by some person of education and ability who ought to be better employed. We only hope that our readers will miss no opportunity of putting their florists, seedsmen, ironmongers and other tradesmen on their guard against this plausible imposition—which is priced at 1s. for 6 and 5s. for 40.

I.M.E.A. Meeting, 1915.—The twentieth annual general and business meetings, which this year take the place of the usual Convention, will be held in London at the Institution of Electrical Engineers, Victoria Embankment, W.C., on June 17th and 18th, as follows:—

June 17th, 10 a.m.—Report by A. S. Blackman (Sunderland) and T. Roles (Bradford), on behalf of Point Five Association, on "The Practical Result of the Point Five Tariff," followed by a discussion.

2.30 p.m.—Report by F. Ayton (Ipswich) on "The Use of Electrical Vehicles in Municipal Service," followed by a discussion.

5 p.m.—Parade and demonstration of electrical vehicles on the Embankment.

June 18th, 9.30 a.m.—Council meeting.

10 a.m.—Annual general meeting.

A meeting of the Point Five Association will also be held at Tricity House, Oxford Street, W., at 7 p.m., on June 17th.

The Council's headquarters will be at the Hotel Cecil. The usual visitors' list will on this occasion be suspended; there will be no social functions, and it is not proposed to invite ladies. The meetings will be restricted to members and official delegates, and these are invited to consider themselves hon. members of the Municipal and County Club, Whitehall Court, on the dates mentioned.

The secretary is Mr. C. McArthur Butler, 28, Bedford Square, W.C., to whom inquiries should be addressed.

Cricket Match.—A match—British Westinghouse Electric and Manufacturing Co., Ltd., Supply Department *v.* Harland Engineering Co.—was played at Birchfields Park, Manchester, on Wednesday evening, May 26th, the result being an easy win for the former. The following are the scores:—

WESTINGHOUSE.		HARLAND.	
D. Sanderson, b Craven	12	Jones, b Elliott	0
Van Leeman, b Hobson	26	Wilson, b Cheetham	4
J. R. Cheetham, b Craven	6	Hobson, c Edwards, b Cheetham	6
N. Armstrong, b Hobson	4	Cowlishaw, c Van Leeman, b Elliott	0
D. E. Elliott, b Hobson	1	Mann, c Edwards, b Cheetham	3
O. C. Oakley, b Hobson	7	Craven, c & b Cheetham	0
J. Wandsworth, b Craven	13	Kemp, c & b Elliott	3
T. Clough, run out	4	Goldenberg, b Elliott	0
Edwards, not out	8	Ross, b Elliott	0
Nickson, not out	3	Kay, b Elliott	0
Carroll, to bat	—	Hartley, not out	2
Extras (for 8 wickets)	7	Extras	4
Total	91	Total	22

Indian Notes.—Our Indian correspondent writes:—*Naini Tal.*—The United Provinces Government have before them a scheme for a hydro-electric installation for the hill station of Naini Tal, which is about 7,000 ft. above sea level. The town is a fairly populous one in the hot season. There are at present three or four isolated electric plants, but coal fuel is extremely expensive, oil is also costly, and the Forest Department look with disapproval on wood-consuming plants; hence it is that a hydro-electric plant is looked on with much favour. The details of the scheme are not yet obtainable, but tenders may be asked for within a reasonable time.

The electrical inspector to the United Provinces, Mr. Tufnell, has just taken a commission in the Army, and has left India for the front in Flanders; he has left a very capable assistant, Mr. Warren, to take over his duties during his absence. Electrically speaking, the United Provinces is tremendously busy just now, with Lucknow, Allahabad, Agra, and possibly Bareilly and Naini Tal on the cards, each for electrification within the near future. Progress may, however, be slow as the capital for the undertakings has to be obtained not from Government, but from the public, and at the present moment capitalists are not over anxious to come forward and put their money into undertakings no matter how probable might be their success.

Acetylene Corrosion.—With the increasing use of acetylene gas the risks of its corrosive effect on pipes and metal containers should be better known. Tests have shown that moist acetylene, as generated, attacked zinc, lead, brass and nickel to a slight extent; iron was affected at about six to seven times the rate; phosphor-bronze about twice as much as iron; but copper suffered more than any other metal tested. Copper was quickly changed into a soft, porous black mass. Tin, aluminium, bronze, german silver, and solder were practically unaffected. Thus it would appear that copper and brass or other copper alloys should not be used as piping for acetylene gas supplies, and that iron should be well tinned rather than galvanised or nickel-plated.—*Manchester Courier.*

(*Continued on page* 801.)

ADMIRAL SIR HENRY JACKSON, K.C.B., F.R.S., M.I.E.E.

THE announcement that Admiral Sir Henry B. Jackson has been appointed First Sea Lord of the Board of Admiralty, in succession to Lord Fisher, is of particular interest to our readers, on account of the fact that he is a member of the Institution of Electrical Engineers, and has attained to a high place in the scientific world, being one of the very few naval officers who have been honoured with the highest distinction that science can bestow —the Fellowship of the Royal Society. The new First Sea Lord is comparatively unknown to the general public, but electrical men cannot fail to be aware of the important position which he occupied when, as Captain Jackson, he was engaged in developing the applications of wireless telegraphy to naval operations, and in adapting the apparatus to the conditions met with on board ship.

Elliott & Fry] ADMIRAL SIR H. B. JACKSON. [*London.*

As a matter of fact, Sir Henry Jackson's connection with wireless telegraphy goes back a great deal further than is generally known, for as long ago as 1891, shortly after his promotion to commander of H.M.S. *Edinburgh* in the Mediterranean, his thoughts were occupied with the problem of communication between warships by means of Hertzian waves; we may point out that Prof. Lodge's first public demonstration of the transmission of signals by this agency was performed at Oxford in 1894, and Mr. Marconi carried out his demonstrations in conjunction with the Post Office in 1897, so that the claim of Commander Jackson to be one of the earliest investigators in this region cannot be disputed. Continuing the work in his spare time, he succeeded in effecting communication over short distances in 1895, when he was commander of the torpedo training ship *Defiance*, at Devonport; his experiments were known to the Admiralty, but were treated as confidential matters. In 1896 he made the acquaintance of Mr. Marconi, and it is said that the two men collaborated in the development of their inventions, which were destined to exercise so vast an influence upon naval strategy.

Sir Henry was placed in charge of the wireless equipment of the Navy, and, as Captain Jackson, continued in the control of this important department until, in 1906, he was promoted to the rank of Rear-Admiral. During this period he was successively in command of the torpedo depôt-ship *Vulcan*, Assistant Director of Torpedoes at the Admiralty, Commander of the battleship *Caesar*, Captain of the torpedo-school ship *Vernon* at Portsmouth, and, finally, Third Sea Lord and Controller of the Navy.

Sir Henry received the Order K.C.V.O. in 1906, and remained at the Admiralty until October, 1908, after which he was in command of the Cruiser Squadron in the Mediterranean for two years. He next represented the Admiralty at the International Conference on Aerial Navigation at Paris in 1910, and a few months later was appointed to command the new Royal Naval War College at Portsmouth. Whilst holding this office he commanded the Seventh Squadron in the Naval manœuvres of 1912. In the following year he became Chief of the War Staff at the Admiralty, a post which he occupied practically up to the commencement of the war; had peace prevailed, he would probably have become Commander-in-Chief in the Mediterranean.

In 1901 Captain Jackson, as he was then known, was elected a Fellow of the Royal Society on account of his researches into electrical physics, and in 1902 a paper entitled "On some Phenomena affecting the Transmission of Electric Waves over the Surface of Sea and Earth" was published over his signature in the *Proceedings* of the Royal Society; in this paper he described a series of experiments which he had carried out on wireless communication between ships equipped with his own apparatus, with a view to ascertaining the screening effect of mountains and hills intervening between the stations, and the effect of atmospheric changes on the intensity and range of signals. Sir Henry was the first to observe that signals ceased to arrive when high land intervened between two ships, one of which was close to the land in question.

From the brief particulars given above, it will be seen that Sir Henry Jackson is by no means merely an electrician, or an engineer, or a sailor; he is an admirable combination of all three, and is regarded by the Navy as one of the most accomplished officers in that distinguished service. The diversified appointments that he has held, together with years of study of the modern problems of strategy and tactics, and a unique insight into the priceless services that science can perform in the defence of our Empire, render him one of the most able of the many brilliant naval officers of the present day, and should inspire confidence not only in the Navy—which knows him well—but also in the general public, which knows him hardly at all.

E

ELECTRICITY IN FARMING.—I.

From time to time attention has been drawn in our columns and elsewhere to the subject of electricity supply for agricultural purposes, more particularly to the developments which have taken place on the Continent and in America, where considerable results on a practical scale have been achieved.

That these results are encouraging and worth following up can be gathered from the data which has been published, but naturally there are difficulties, and it is not surprising that the limitations of such work should form a subject for discussion in the States. What concerns us most, however, is whether in view of the results obtained abroad there is not scope for similar developments in this country.

Oerlikon Three-phase Truck Motor driving Chaff Cutter.

A paper by Mr. J. L. White, of the Oregon Power Co., which throws some light on the difficulties encountered in Pacific Coast farming districts, points out that the farmer is of the "show me" class, and therefore must be convinced of the economical and practical value of electricity in performing his work before he will spend any great amount of money for its adoption.

This is the real difficulty, and it is probably more pronounced in this country, the supply authorities in farming centres being themselves unconvinced; we only know of one chief engineer who has had sufficient prescience to make a business of supplying local farmers, by means of cheap pole lines, but the question is being considered in several directions.

The author goes on to point out that it will not pay to make long and costly transmission line extensions solely for the purpose of serving a scattered farm load, although it is equally true that a farming load will pay as a by-product when such extensions already exist or are being made to take care of other classes of business.

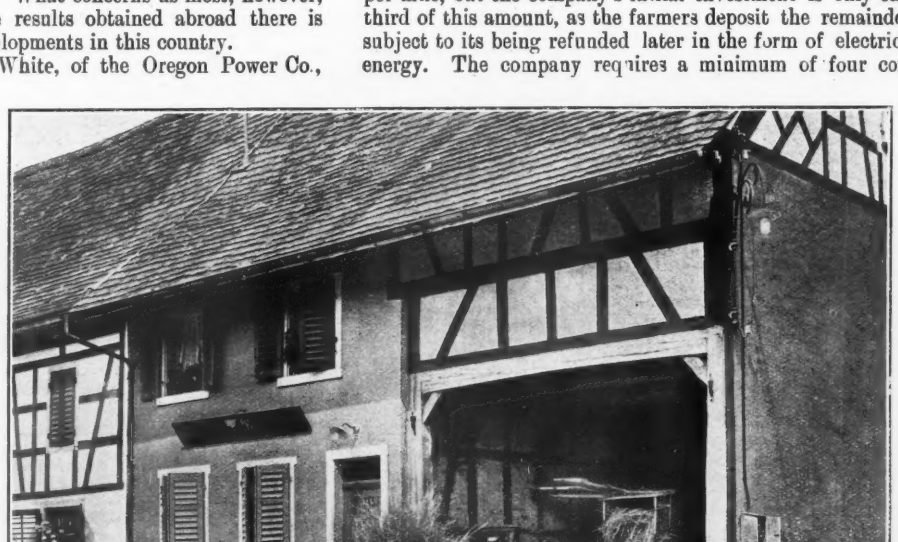
The stumbling block is the capital investment, and this has been met in several ways; in some cases the farmers have financed distribution systems, purchasing energy and retailing it amongst themselves, or they have paid the whole or part of the cost of the line, or have guaranteed a minimum income to the authority carrying out the work, this guarantee being such that the cost of the line is returned in from one to three years.

In some cases the consumer contributing a proportion of the capital cost has this returned to him if he succeeds in inducing others farmers on his line to take a supply.

Any attempt to deal with farming supply evidently resolves itself into a question of cost of service, and a short article from an American source gives the cost of a mile of rural service line, using poles 200 ft. apart, as follows: —

	Unit price.	*Item cost.*
27 poles (25 ft. high with 5-in. top)	$1.15	$31.05
10,560 ft. No. 8 copper wire	0.16	126.40
27 telephone cross-arms ...	0.13	3.51
27 through bolts	0.05	1.35
54 locust pins	0.013	0.70
54 insulators (porcelain) ...	0.03	1.62
54 square galvanised washers	0.009	0.50
Guy anchors (average) ...	—	5.00
Labour and hauling ...	—	7.200
Total field expense for material and labour ...	—	$242.23

This includes nothing for supervision, tools, insurance, interest, &c., and the all-in cost is about $300 (£60) per mile, but the company's initial investment is only one-third of this amount, as the farmers deposit the remainder, subject to its being refunded later in the form of electrical energy. The company requires a minimum of four con-



Wagon Motor driving Thrashing Machine.

sumers a mile before commencing operations, and at least £7·2 a year is required from them to cover interest and depreciation charges on the mile of line.

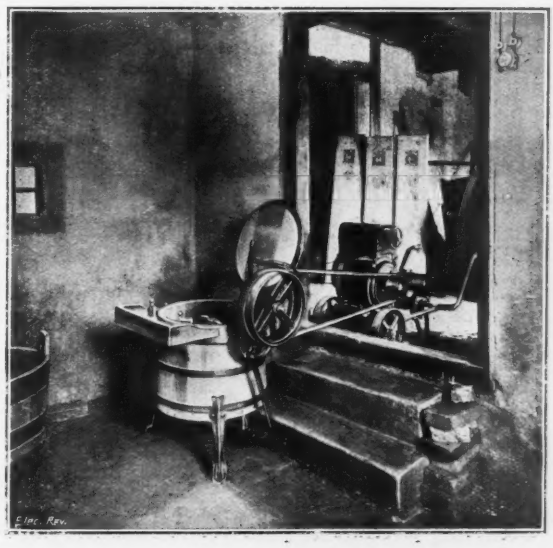
The company's farmer customers in a comparatively limited area now number 214; of these 23 have been connected in a year, and the average income from each of them for the first year was £3·5, which was regarded as satisfactory if not profitable, although the supply company's financial charges are also on a reduced scale in the development stage.

A writer in a recent issue of the *General Electric Review* gave some statistics as to the electricity used by American and German farmers, which showed that 150 American farms in the central west, averaged 190 acres each, and had an average electrical installation of 35 per cent. lighting and 65 per cent. power. The revenue derived from them was £10·2 per farm, or about 13½d. per acre per year.

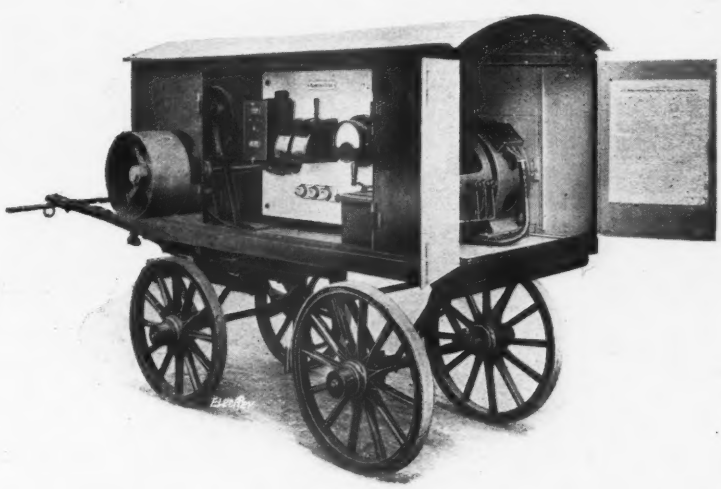
The statistics include some dairy farms, which are large users of electric power, and the charge for current varied between 2d. and 5d. per unit.

Corresponding German figures for an average 63-acre farm show that lighting and small power applications give a return of about 11d. per acre per year, but these gave only 20 per cent. of the revenue derived, the other 80 per cent., consisting of thrashing, ploughing and traction, bring up the total yearly revenue per farm to over £16. The prices charged are about 5d. per unit for lighting and 2½d. or less per unit for power.

The writer points out that the average farm load—presumably in America—has an excellent diversity factor, and that the peak load comes during the summer months, and is essentially a day load, with the exception of a small amount of lighting. On strictly country lines an appreciable lighting peak is noticed in summer between 4.30 and 5.30 a.m., and in winter between 5 and 7 a.m., while very little lighting is used in the evening.



Portable Motor driving Churn.



Oerlikon Portable Driving Motor and Switchgear, mounted on Wagon.

The amount of power likely to be required per farm appears to vary within wide limits; three cattle breeders, for instance, head the list with an average of 17½ KW. per farm, and use 30 units per KW. installed per month.

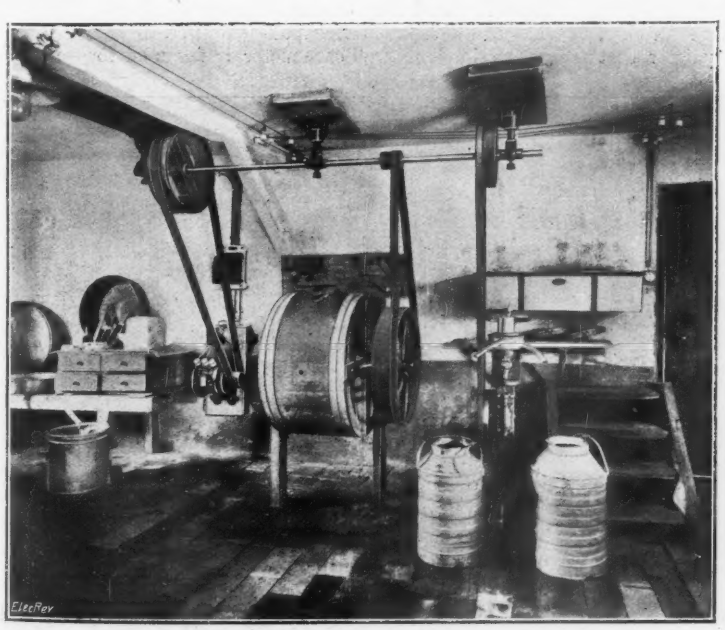
Two classes of dairy farms average 7 and 10½ KW., and use 31 and 9½ units per KW. per month respectively—the former high figure being due to the use of cold storage and milking machines and cream separators.

An average small motor and lighting farm requires some 2·6 KW. of plant, and uses 15·8 units per KW. installed per month; while the market gardener averages some 2 KW. of plant and 19 units per KW. per month, principally for pumping operations.

The writer's concluding advice, that if such farm lines can be built now to give only a small return, they should be constructed in order to forestall the isolated plant, which is hard to displace if once installed, is equally applicable to this country, where small petrol and oil engines are being adopted in large numbers by farmers.

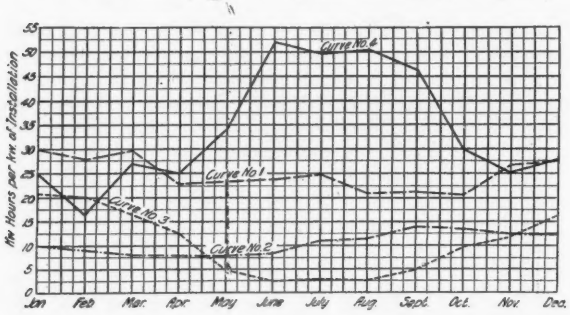
The question naturally occurs as to whether such data as that given is applicable to farming in this country; in fact, whether the average British farm can be compared to an average American farm of the class referred to by the writer.

In point of size, it is interesting to note that a *Times* article on British farming of a year or two back stated that the greater part of the land of the



Fixed Motor Driving Dairy Machinery.

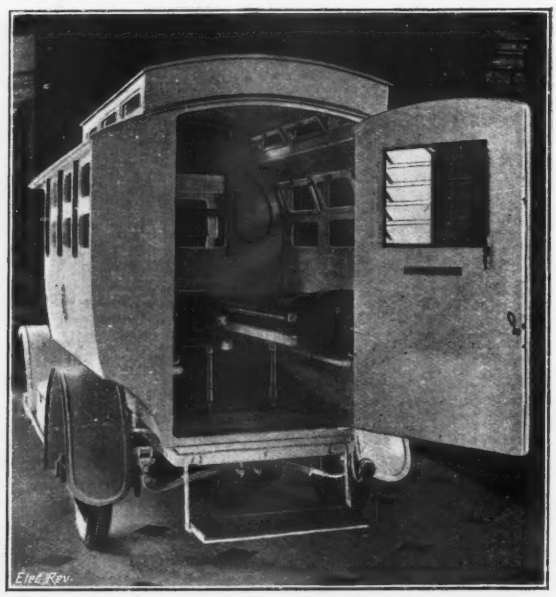
country is held by men occupying single farms of from 150 to 500 acres, which compares sufficiently well with



Curve 1, lighting, irrigation, and general farming; Curve 2, lighting; Curve 3, huskers, shredders and feed grinders; Curve 4, pumping and refrigeration.

CURVES SHOWING COMPARATIVE CURRENT CONSUMPTION OF FOUR PRINCIPAL TYPES OF AMERICAN FARM LOADS.

the average of 190 acres given for the American farms. The article proceeded to point out that America and the



INTERIOR OF ELECTRIC AMBULANCE FOR DURBAN (see p. 799).

Colonies, so often quoted as examples of modern farming, had nothing to teach us, from which we may infer that our farming community is sufficiently progressive to adopt electric light and power if it is brought within its reach on competitive terms, especially in view of the necessity nowadays of economising in manual labour.

The position of the farmer in regard to motive power on the land was indicated by one of them in an article in the *World's Work*, who thought there would be a great opening in the future for it, and pointed out that farmers said they would have farm motors if they were cheaper, while the manufacturers replied that they could easily make them cheaper if more were bought.

The oil-engine builders are fully alive to the possibilities of farm business, and some of their booklets demonstrating the farm uses of the oil-engine should convey a hint to electrical people in this country, who do not appear to have studied the problem.

On the Continent electrical firms have designed special equipment to meet the requirements of the agriculturalist, and through the courtesy of the Oerlikon Co. we are able to illustrate some Swiss farming applications in which it will be noted that portable types of apparatus are employed. These are constructed with either direct or alternating-current motors, in the smaller powers on two-wheeled hand trolleys, while heavier motors are mounted on four-wheeled trucks.

A typical outfit of the smaller class includes a motor geared to a second motion shaft having different sized pulleys at either end, in addition to a pulley on the high-speed motor shaft.

The gear ratio of the spindles is usually 5 to 1, and the arrangement gives pulley sizes and speeds to suit most

THE LATE HARRY GUSTAV BYNG
SEC. LT. 2ND BORDER REGIMENT (see p. 799.)

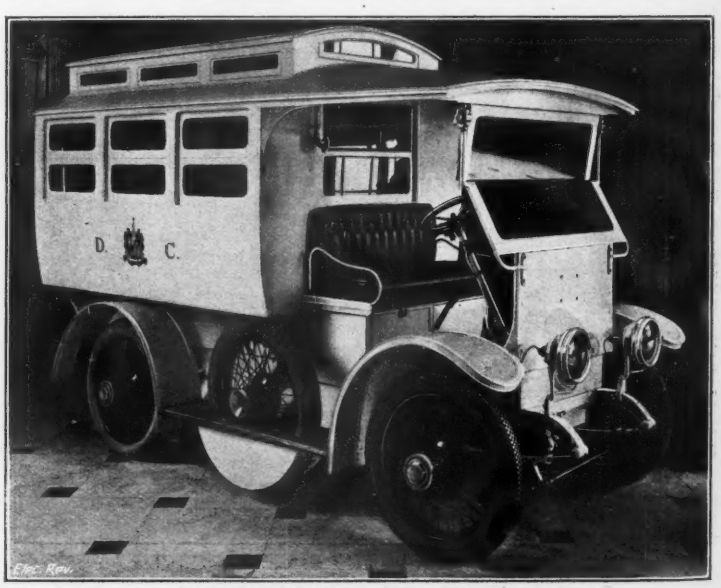
requirements. A starter and fuses are mounted on the motor frame and coupled to a cable drum on the trolley, carrying some 10 m. of cable fitted with a suitable end connector for coupling to the supply mains.

A portable 4-H.P. three-phase motor equipment of this kind would cost about £30; no fixing is required for driving purposes, the weight of the apparatus being sufficient to retain it in position.

Larger apparatus, of more elaborate design but similar in principle, is utilised for driving thrashing machinery.

In this case the motor, switches, cable, drum, &c., with 100 m. of cable, are carried in a sheet-iron van, from the sides of which the driving pulleys project.

The simple squirrel cage motor is favoured for this class



ELECTRIC AMBULANCE SUPPLIED TO DURBAN CORPORATION, SOUTH AFRICA (see p. 799).

of work, and by the use of star-delta starters, and fast and loose pulleys for the larger motors, line disturbances at starting can be avoided.

An American instance of the use of similar apparatus was described in the *Electrical World*; in this case the farmers in a district combined to purchase an electric set for thrashing purposes, consisting of a 2,200/220-volt transformer, 30-H.P. single-phase motor and switches, mounted on a steel-frame truck, at one end of which a temporary ladder pole is placed to carry the 2,200-volt lines. This outfit cost some £200, and it is reported that the farmers' league saved 25 per cent. by using it in place of steam tackle.

In this country farms in the vicinity of towns, where manual labour costs probably 20 per cent. more than in the more remote districts, should present little difficulty to the tactful electric supplier, especially if portable apparatus such as that referred to can be hired out on similar terms to those with which the farmers are familiar for other plant.

THE LATE HARRY GUSTAV BYNG.

The war has robbed the electrical industry of one of its most promising sons by the loss of Second Lieut. Harry Gustav Byng. He was the third son of the late Gustav Byng (founder and late chairman of the General Electric Co., Ltd.) and Mrs. Byng, of 32, Bryanston Square, W. He was born in July, 1889, and educated at Harrow, where he was captain of the school gymnasium eight, monitor and head of his house, for which he played both cricket and football; he also played for the Harrow Association football team. After leaving Harrow he joined Faraday House, and was awarded the silver medal in his year. He then completed his education at Harvard University, where he distinguished himself by passing all his examinations with honours. He enjoyed extraordinary popularity, both socially and as a good sportsman. He was captain of the Harvard Association Football XI. When leaving Harvard he joined an exploring expedition into the lesser-known parts of Canada, and after a short return home joined the General Electric Co., of Schenectady, as a pupil. He distinguished himself in the test room and was on the fair road to success, when his duty towards his family called him back in order to take part in the work of the General Electric Co., Ltd. He settled in Warwickshire so as to live near the works at Witton, and was on the point of assuming a position of responsibility when war broke out. His sense of duty to his country made him join His Majesty's Forces during the first week. He trained with the Artists Rifles and went to France with them at the end of September, returning home on March 21st on five days' leave, during which time he married Miss Evelyn Curtis, of Boston and Beverley Farms, Mass., U.S.A. Immediately after he was gazetted 2nd Lieutenant of the Second Border Regiment and fell in battle on May 16th, near Festubert, in France, whilst leading his platoon. His Commanding Officer wrote:—

Mr. Byng was wounded whilst most gallantly leading his platoon in action on May 16th. He was universally popular in the regiment. He had done very good work reconnoitring the enemy's trenches, and his loss is very great to the battalion.

The Adjutant of his regiment wrote:—

He was shot whilst leading his men, and fell actually on the enemy's trenches. He lay quite uncomplaining, and would not allow any of his men to carry him back, because of the danger to their lives.

Those who knew the late Mr. Byng will remember him as a young man of exceptional promise and charm. His death comes as a great personal loss to his family, to whom we tender our deep sympathy, and to his many friends in electrical and other circles.

CARTER ELECTRIC AMBULANCE FOR DURBAN.

We illustrate on page 798 an electrical motor ambulance recently supplied by Messrs. Carters, the ambulance specialists, of New Cavendish Street, W., for the Corporation of Durban, South Africa. While the makers have proceeded on definite and well-known lines in regard to the chassis, the mounting of the vehicle and the design of body with the interior accommodation are quite new and offer many advantages. The chassis is of a type identical with two of those now in use in the City of London, fitted with a Greenwood & Batley 8-H.P. twin motor and Tudor Ky. B. 9 type battery; the controller gives six speeds forward, reverse, and electric brake, and, in addition, hand and foot brakes are provided. The chassis runs on Rudge-Whitworth steel detachable pneumatic-tired wheels. The body of the car is of teak throughout; the interior is lined with aluminium, and finished like the exterior in white Ripolin. Special ventilation is obtained by the adoption of a lantern roof with opening glass frames, window fasteners to the main window frames, and glass louvred windows in metal frames in the front end and the door. The car is intended for general use in Durban and provides accommodation for two invalids or injured; the stretchers are fitted with Carters' patent extension gear and a number of accessories are provided.

This is, we understand, the first electrical motor ambulance to be used in South Africa, and in view of its excellent features, it is quite safe to predict that other municipalities will follow the example set by Durban.

REVIEWS.

Polyphase Currents. By Alfred Still. Second edition, revised. London: Whittaker & Co. Price 6s. net.

The many friends of the first edition of this little book will be glad to see that its success has led to the issue of a new edition, which will, in its turn, make new friends.

The edition before us does not differ in essentials from its predecessor, but the contents have been to some extent rearranged and rewritten, while the diagrams have been mostly redrawn in order to make them agree with the International Convention regarding the direction of rotation of alternating vectors. The symbols have also been brought into agreement with the present standard conventions.

It is assumed that the reader has a fair knowledge of continuous currents, but that he comes to the study of the book without any knowledge of alternating currents. The book consists, in fact, of an introductory study of the principles of alternating currents, so far as this can be undertaken by the application of graphical methods depending on the use of the simple vector diagram.

Questions of construction and design are wisely left aside for treatment in books devoted to this side of the subject, while the author confines his discussion to the main underlying principles of the generation, transmission and conversion of alternating currents. The experimental aspect of the subject is also left almost entirely on one side for treatment elsewhere. The author's treatment is simple, clear and effective, while he displays high qualities as a teacher and evidence of painstaking thoroughness in his work. Throughout, the method of analysis is non-mathematical and based almost entirely on graphical constructions; but in several directions (for instance, in dealing with unbalanced loads) the author shows how the simple vector diagram may be extended beyond the limits of application usually assigned to it in elementary text-books.

It will be gathered from what has been said that the book is not a general text-book, but rather an introduction to the study of alternating currents confined to one aspect of that subject. Within these modest limits the book is quite excellent, and can be cordially commended to the student.

Polyphase induction motors come within the scope of treatment, and the simpler forms of circle diagrams are

clearly given, although these are not developed into the forms which are usual in commercial practice. Some space is occupied in explaining the principle of the polyphase compensated motor provided with a commutator. It seems a pity that the author did not extend this treatment to include some of the better known forms of single-phase motor having a commutator. Perhaps this would have taken him too far—at all events, he has omitted all discussion of single-phase motors, whether with or without commutators.

Frequency converters, rotary converters and motor-converters are treated in a simple and interesting way in a chapter which begins by showing the development of the asynchronous generator from the polyphase induction motor.

Electric Bells, Alarms and Signalling Systems. By H. G. White. London: Rentell & Co. Price 1s. 6d. net.

As indicated by its title, this book deals chiefly with electric bell, alarm and signalling applications and systems. Circuits for every bell and indicator application of any importance are represented by clear diagrams; but mechanical details of apparatus are described no more than is necessary to explain their use. By adhering rigidly to this very reasonable limitation of scope, the author is able to give in small compass an exceptionally useful treatment of his subject, and this work should certainly be in the hands of every practical man engaged in bell and indicator work or interested in their installation, as well as every student of the subject. Bells and indicators are not so simple as they seem, particularly in respect of their connection for special purposes, and endless trouble is frequently occasioned by neglecting to study this subject properly.

Chapter I is devoted to simple bell circuits and includes useful notes on selection of bell resistance, transformers and reductors for high-voltage circuits. Chapter II deals with indicator systems and is exceptionally useful; a study of the information and diagrams presented should go far to remove the vagaries and troubles so frequently experienced in indicator installations. A comprehensive treatment of the general principles of fire-alarm systems and of open and closed circuit burglar alarms is presented in Chapter III, the connections of private alarms and public call systems being included. Fault localising and points to be observed in wiring form the subject matter of a short but very valuable chapter, and, by including a chapter on mine signalling systems, the author has greatly increased the value of the book while extending the range of its readers. The bearing of Home Office Regulations on this branch of signalling is kept well to the fore. The work is indexed thoroughly and constitutes excellent value for money.

SOME NOTES ON SHUNT REGULATING RESISTANCES.

By Thomas Carter.

(*Concluded from page 753.*)

III. *A Special Grading for Ordinary Regulators.*—While in very many cases of shunt regulation by the ordinary method, the standard connections for which are shown in fig. 6, the successive steps of resistance can be determined to suit some specified condition of regulation without reference to anything else, it is necessary in an increasing number of cases to consider the question of sparking between contacts as the resistance is introduced into circuit. The use of motors with increasingly great speed ranges on high-voltage circuits means that, with more volts to be absorbed in the regulator, the volts between contacts tend to increase in consequence of modern practice. The point at which sparking begins varies with many conditions, such as the amount of current dealt with, the shape of the contacts and their material, and the nature of the sliding contact. Once more experience alone indicates the correct conditions. It may be permissible to allow more volts between contacts at the low-current end of a regulator than at the high-current end; but, at any rate, as a starting point, it is useful to get out the grading for equal volts

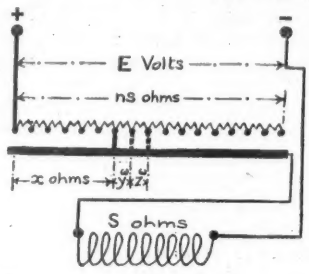


Fig. 6.

between contacts. The conditions upon which this depends will now be investigated.

The exciting voltage, E, has across it the field winding, whose resistance is s ohms, and a part x, of the regulator, whose total resistance is $n\,s$ ohms. Suppose the resistances of the next two sections to be introduced to be y ohms and z ohms respectively. Also let e be the voltage between contacts on introducing any step of resistance, e being constant. Then—

$$e/\text{E} = z/(s + x + y + z) = y/(s + x + y).$$

Hence, by the ordinary rules of ratios,

$$e/\text{E} = (z - y)/\{(s + x + y + z) - (s + x + y)\} = (z - y)/z = 1 - y/z, \text{ or } y/z = 1 - e/\text{E}.$$

Thus if e is constant y/z must be constant, and therefore also $(s + x + y)/(s + x + y + z)$, which from the above is equal to y/z, must also be constant and equal to $1 - e/\text{E}$. That is to say, the resistance must be graded so that the successive totals between terminals, of field plus regulator resistance, form a geometric series. Let r be the ratio of this series. Let the ratio of maximum to minimum shunt current, determined experimentally as in Section II, be p. Then clearly $p = n + 1$, since the maximum shunt current is E/s and the minimum is $\text{E}/s\,(n + 1) = \text{E}/p$ by definition. The value of n is, therefore, in this case also experimental.

The first term of the series is s, and the last is $s\,(n + 1)$. Let there be t terms, or steps of resistance. Then—

$$r = \{s\,(n + 1)/s\}^{\frac{1}{t}} = (n + 1)^{\frac{1}{t}} = p^{\frac{1}{t}}.$$

It has already been shown that $e/\text{E} = 1 - y/z$. Now $y/z = (s + x + y)/(s + x + y + z) = 1/r$, and hence $e/\text{E} = 1 - 1/r = 1 - 1/p^{\frac{1}{t}} = (p^{\frac{1}{t}} - 1)/p^{\frac{1}{t}}$, or $\text{E}/e = p^{\frac{1}{t}}/(p^{\frac{1}{t}} - 1)$, which can be put into the form $(\text{E}/e - 1)(p^{\frac{1}{t}} - 1) = 1$, which is a rectangular hyperbola with

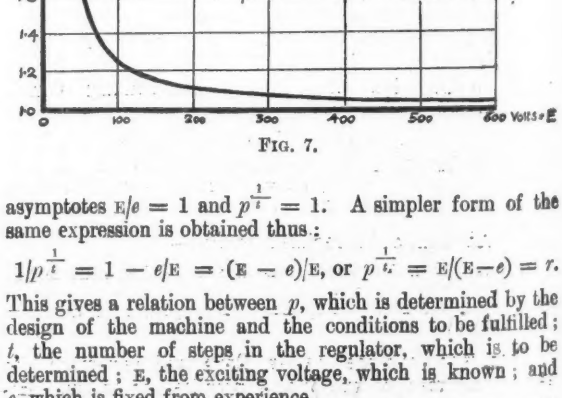


Fig. 7.

asymptotes $\text{E}/e = 1$ and $p^{\frac{1}{t}} = 1$. A simpler form of the same expression is obtained thus:

$$1/p^{\frac{1}{t}} = 1 - e/\text{E} = (\text{E} - e)/\text{E}, \text{ or } p^{\frac{1}{t}} = \text{E}/(\text{E} - e) = r.$$

This gives a relation between p, which is determined by the design of the machine and the conditions to be fulfilled; t, the number of steps in the regulator, which is to be determined; E, the exciting voltage, which is known; and e, which is fixed from experience.

Consider now a definite case on general lines. Take e as 20 volts. Then a curve can be plotted, as shown in fig. 7,

showing the relation between the ratio r, or $p^{\frac{1}{t}}$, of the geometric series, and the line voltage E. The curve is plotted from the following values, derived from the expression $r = p^{\frac{1}{t}} = E/(E - e)$:—

E ...	...	...	40	70	100	200	300	400	500	600
$E - e$	...	...	20	50	80	180	280	380	480	580
$r = p^{\frac{1}{t}} = E/(E-e)$			2·00	1·40	1·25	1·11	1·072	1·052	1·042	1·035

Other curves could be plotted on the same chart for different values of e, and these would at once give the ratio of the geometric series necessary, at any value of E, to limit e to any desired amount. It is clear, then, that for a given value of E, the value of $p^{\frac{1}{t}}$ is constant for a definite value of e. It now remains to investigate the relation between

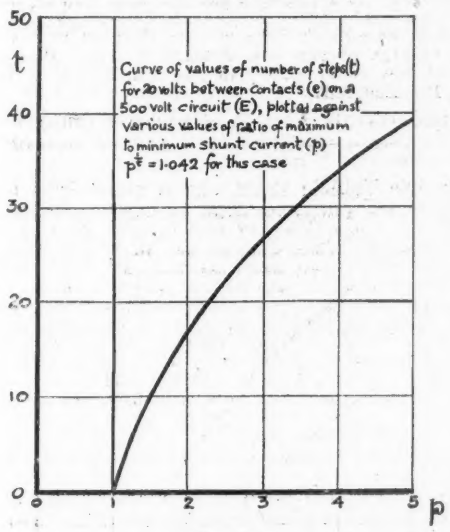


FIG. 8.

t and p as p increases in value. As an example, do this for a 500-volt circuit, for which it has already been shown that for $e = 20$, $r = p^{\frac{1}{t}}$ must have the value 1·042. If $p^{\frac{1}{t}} = 1{\cdot}042$, then clearly $t = \log p/\log 1{\cdot}042$, and the following relation is obtained :—

p	...	1·0	1·25	1·5	1·75	2·0	2·5	3·0	3·5	4·0	4·5	5·0
t	...	0	5·4	9·9	13·6	16·8	22·3	26·7	30·4	33·6	36·7	39·0

The curve shown in fig. 8 gives the relation between p and t graphically, and shows how, for a 500-volt circuit, the number of steps of resistance required to limit the volts between contacts to 20 increases as the ratio of maximum to minimum shunt currents increases. A set of curves like this would enable the number of steps necessary for any given case to be read off at once. Or, if the dangerous point is not frequently reached, the value of t for any specified condition is readily calculable from the simple expression $p^{\frac{1}{t}} = E/(E - e)$, which, solved generally for t, becomes $t = \log p/\log E/(E - e)$.

The case considered in this section is one which can be most conveniently dealt with by a set of symbols in the shape of a formula rather than by a set of curves ; the curves have been illustrated, however, to show the general shape assumed by the variables entering into the calculation, and there might be cases where a set of curves on the lines indicated would be useful in no small degree.

It is scarcely necessary to mention that in all problems connected with geometric series, in which the extraction of a root such as, say, the 36th or the 50th, is involved, the use of a log-o-log scale on a slide rule is of the greatest possible value as a time saver. There are several of these on the market ; the writer has his own favourite, while others, no doubt, prefer other types. But the principle embodied in such slide rules enormously increases their range of usefulness.

In the setting-out of the calculation of a resistance with geometric grading, successive totals between terminals are obtained as the terms of the series, beginning with s and ending with $(n + 1)\, s = p\, s$. Successive steps are then obviously obtained as the differences between the successive totals so found, and the current capacities at each step are found by dividing E by the total between terminals up to and including the step considered.

NOTES.

(*Continued from page 794.*)

Fatalities.—In the Stirling Sheriff Court last week Sheriff Moffat and a jury held an inquiry into the death of John Stirling, coal-cutting machineman, Hagga, who was fatally injured in No. 3 Broomrigg Pit, Dennyloanhead, belonging to the Banknock Coal Co., on April 19th. David Todd, certificated colliery manager, Dennyloanhead, and William McCallum, chief electrical engineer to the Banknock Coal Co., were warned that, in view of possible future proceedings, they need not answer questions which might appear to prejudice them. Sheriff Moffat, in addressing the jury at the close of the inquiry, said it was quite apparent from the medical evidence that all the appearances were consistent with death resulting from electric shock, and there was quite clear evidence that at the time of the accident deceased was grasping a highly-charged electric coal-cutting machine which was in a defective condition. The chief electrician (McCallum), who was a most reliable witness, said the machine was defective owing to the non-use of the bolt, which caused the connection of the cable not to be tight. This, in turn, brought about the leakage of electricity into the frame of the machine, and naturally was the cause of death. The fact that the coal-cutter became alive might also be due to the defective state of the leads through the body of the machine. He did not think any fault or negligence could be attached to Mr. David Todd, the manager. He was not an electrician and did not examine the machine. Then it was quite apparent it was not Mr. McCallum's duty personally to examine the coal-cutter, as he stood more or less in the light of an adviser to the company. It was unfortunate that McCann, who was the electrical engineer at the pit, had been absent from the inquiry, and that the principal person who had had the supervision of the machine had not had an opportunity to give evidence. In the circumstances it would not be proper to say that any particular individual was at fault, but they could say that the coal-cutter itself was faulty. The jury returned a verdict that the accident occurred through the faulty condition of the machine, caused by want of proper insulation. The jury added a rider to the effect that there seemed to have been some negligence, but they did not feel called upon to lay the blame of that negligence at the door of any particular person.

A boy of seven received a fatal electric shock on May 27th while trespassing on Volk's electric railway at Brighton. The inquest was adjourned for expert evidence.

Newfoundland.—Mr. T. L. Wilson, formerly of Ottawa, has made registration at St. John's, Newfoundland, of a company with a capital of $20,000,000, to develop electrical energy in that Colony for the manufacture of nitrogenous fertilisers from the nitrogen of the atmosphere.

Penalty for Exporting Carbons.—At East Ham on Wednesday, according to the *Standard*, Messrs. Duncan Macneill and Co., Winchester House, Old Broad Street, E.C., were fined £5 and £3, together with £10 10s. costs, on two informations for failing to comply with the provisions of the Customs and Inland Revenue Act, and failing to comply with the orders of the Customs Consolidation Act. Mr. Cecil Simpson, who prosecuted for the Customs and Excise, said the first offence was that the defendants sent to the Royal Albert Dock two cases of searchlight carbons which were supplied by an electrical company. The goods were prohibited for export by Royal proclamation. The second offence was for not making a proper entry with the Customs before shipment. The goods were to be used by a navigation company on rivers in India. Mr. Basil Watson, for the defence, admitted the charges, and said the goods were only valued at £25. An apology was offered.

Cab-Signalling Needed. — Lieutenant-Colonel von Donop, in his report to the Board of Trade on the derailment of a Midland Railway express passenger train from York to Sheffield at Chaloner Whin Junction, York, on the North-Eastern Railway on March 28th, states that it was another instance of an accident mainly due to a driver not noticing that his distant signal was at danger.

Electrical Trade in Hong-Kong.—We learn that the opportunity for the introduction of cheaper grades of electrical supplies in the Hong-Kong field growing out of the closing of the trade to German manufacturers as a result of the war, is being taken advantage of by Japanese manufacturers, and many lines of electrical goods are going into the market from that country. There are three well-equipped factories for such goods in Japan, according to Hong-Kong importers concerned in this trade, and all of them have carried on an active campaign in behalf of their goods, which include practically all lines of ordinary electrical supplies, aside from electrical machinery, and the finer grades of electrical apparatus.—*Eastern Engineering.*

Educational. — NORTHAMPTON POLYTECHNIC INSTITUTE (LONDON).—A free scholarship, of the value of £30, open to all comers, is being offered to students of optics, in which the chances have been greatly enlarged by the shutting-off of alien supplies due to the war. Particulars can be had from the hon. secretary and treasurer, Mr. Henry F. Purser, 35, Charles Street, Hatton Garden, London, E.C.

Institution and Lecture Notes.—Junior Institution of Engineers.—A lecture was recently given on Diesel engines, by Mr. W. A. Tookey.

Institution of Electrical Engineers.—The report of the Committee of the NEWCASTLE LOCAL SECTION, presented at the annual general meeting on May 17th, shows a decrease in membership, mainly in the Students' Section, the total now being 261. The growing importance of the Tees-side sub-section is clearly shown in the report. The following were nominated and have been duly elected as officers and committee for next Session :—Chairman, Mr. P. V. Hunter; vice-chairmen, Messrs. H. W. Clothier and A. H. Marshall; Committee, Messrs. E. Fawssett, G. L. Porter, W. F. T. Pinkney, H. S. Ellis, C. Turnbull, W. G. Guns, T. Carter, M. G. S. Swallow, C. S. Vesey Brown, R. W. Gregory, J. R. Beard, G. L. Drury, H. Henderson, Dr. W. M. Thornton, Messrs. F. O. Hunt, A. P. Pyne, J. R. M. Elliott, and W. Cross; Hon. Treasurer, Mr. C. Vernier; Hon. Secretary, Mr. J. R. Andrews.

Volunteer Notes.—3RD BATT. (OLD BOYS) CENTRAL LONDON REGIMENT (VOLUNTEERS).—This is a voluntary organisation, consisting of Old Public School and 'Varsity men and their friends, and is affiliated to the Central Association of Volunteer Training Corps. Drills take place every evening in Regent's Park and other centres, and a week-end camp is held at Wembley Park, N.W. An O.T.C. Class is also held at Lord's Cricket Ground, N.W., for men desirous of obtaining commissions. Over 350 have already obtained them through the Corps' instructions. A large number of electrical men are members of the Corps. Men wishing to join the Corps should send in their applications immediately to the Hon. Secretary, 205, Oxford Street, W.

BATTALION ORDERS BY COLONEL S. G. GRANT (OFFICER COMMANDING).—Week-End Parades.

Saturday :—The Battalion will parade at Baker Street Metropolitan Station at 2.30 p.m. "C" Company, under the command of Captain R. J. C. Eastwood, will proceed direct to Wembley Park and take up a defensive position to meet an attack coming from the south-easterly direction. "A," "B" and "D" Companies, under the command of Mr. H. O. King, will detrain at Neasden and attack the camp at Wembley. Route to be followed will be communicated later.

Sunday :—7 a.m. Reveille.
10 a.m. Church Parade.
10.20 a.m. Companies' Parade.
2.15 p.m. Battalion Parade.

The Quartermaster has made arrangements for serving tea to friends of members, on Sunday next. Price 6d. each. Tea will be served between 4 o'clock and 5.30 p.m. in the marquee set aside for the purpose.

A. G. JOINER, *Captain and Adjutant.*

Late Legal.—ADNIL ELECTRIC CO., LTD., *v.* BRITISH TRADERS' ASSOCIATION.—By a majority the Court of Appeal on Wednesday dismissed an appeal by the Adnil Electric Co., Ltd., from orders by Mr. Justice Ridley staying actions brought by them against the British Traders' Association for money had and received, and against Andcole & Turner, Ltd., for goods supplied. It appeared that in 1909 the plaintiff company was formed to take over the business previously carried on by Marples & Leach, Ltd. The shareholders were mainly German, and Mr. Marples and Mr. Leach were appointed joint managers. Solicitors were also appointed. The British Traders' Association were a debt collecting agency who obtained judgment against a debtor in the name of the plaintiff company. In respect of that judgment this action was brought. The action against Andcole and Turner was for goods supplied. The question was whether the solicitors acting for the company had authority to bring the action. They had been instructed by Mr. Marples and Mr. Leach, but since the war broke out had received no particular instructions from the directors. There were three directors—a Dutchman and a German, both resident in Germany, and an Englishman who was interned there. Mr. Gore Browne, K.C., for the company, submitted that there was authority to bring the action. Lord Justice Swinfen Eady said he agreed with Mr. Justice Ridley in that the evidence did not satisfy him that Marples & Leach had authority to bring those actions. Lord Justice Phillimore assented. Lord Justice Bankes concurred with Lord Justice Swinfen Eady. The appeals were, therefore, dismissed.

CITY AND SOUTH LONDON RAILWAY CO. *v.* H.M. POSTMASTER-GENERAL.—A special case stated in this action to determine questions as to the right of laying telegraph and telephone wires, was before Mr. Justice Neville in the Chancery Division on Wednesday. Mr. Harmann, representing the plaintiffs, stated that the matter was somewhat complicated, but there was a prospect of a settlement. Under these circumstances, he asked, with the consent of the defendants, that the case might stand over, with liberty to restore it to the list for hearing on seven days' notice. His Lordship allowed that course to be adopted, and the case stood over generally as arranged.

The King's Birthday Honours.—The List of Honours which appears just as we go to Press with the last pages of this issue, contains the following announcements that will interest our readers :—

Upon Sir Henry Norman a baronetcy is conferred.

The honour of knighthood is conferred upon Lieut.-Col. Wm. Forbes, general manager of the Brighton Railway; Edward Rigg, Esq., C.B., Superintendent of the Operative Department of the Royal Mint; and W. Slingo, Esq., Engineer-in-Chief of the General Post Office.

Mr. David Mitchell Stewart, Superintending Engineer, General Post Office, is appointed to the Imperial Service Order.

To all these gentlemen the ELECTRICAL REVIEW tenders its congratulations. An account of the career of Mr. Slingo appeared in our pages at the time of his appointment to succeed Major O'Meara as Engineer-in-Chief (ELEC. REV., March 8th, 1912).

Fire Prevention.—The British Fire Prevention Committee has issued a "Warning" circular (No. 16) for factories and works engaged on Government and war emergency supplies, containing useful advice as to the precautions that should be taken to prevent the outbreak of fire, of which the risks are increased at times of high pressure and all-night working. Copies can be obtained free on application to the Committee at 8, Waterloo Place, Pall Mall, S.W.

Appointments Vacant.—Switchmen (30s.) for Newport electricity department; assistant electrical engineer (£150), for Government of Malta.

Electric Vehicle Costs.—In a recent issue, our contemporary, the *Commercial Motor*, gave some particulars of the electric vans employed by Messrs. J. Lyons & Co., Ltd., the well-known caterers. These comprise one G. V. and seven Edison vehicles, and for four weeks ended April 16th, for two ½-ton vehicles the average current cost per mile was '45d. on a mileage of 222·3; for two 2-ton vehicles the average cost of energy per mile was '73d. on 192·1 miles; for one 5-ton vehicle the average cost of current per mile was 1·3d. on a mileage of 195·2. One Edison ½-ton and one Edison 2-ton vehicles have each run over 7,000 miles between November, 1914, and May, 1915, while the other five Edisons, each covered between 3,000 and 5,000 miles in that time. While the initial outlay is greater, Messrs. Lyons find the working cost of the electric compares very favourably with their petrol vehicles, and they intend to extend their "electric" fleet.

Anti-Aircraft Appliances.—A County Council report mentions that a new motor "emergency tender" has been put into commission. This appliance carries a number of smoke helmets, and, in addition, is fitted with a dynamo, portable searchlights, and an electric blower for forcing air into places where dense smoke or poisonous gases exist. It is manned by specially selected firemen, who devote considerable time to maintaining the apparatus and training and practising therewith.—*Standard.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The newly constituted Spenborough U.D.C. has decided to retain MR. ALBERT PICKERSGILL as electrical engineer, at the same salary and on the same conditions as hitherto attached to the appointment.

MR. E. BROAD has been promoted to the position of shift engineer at the electricity works of the Heston and Isleworth U.D.C., taking the place of Mr. J. Fletcher, who has been appointed station superintendent at Worksop.

Derby Corporation E.L. Committee recommends that the salary of MR. A. THOMSON, charge engineer, be increased from £2 7s. per week to £130 per annum.

Tramway Officials.—MR. W. TUKE ROBSON, late manager of the South Shields Corporation tramways, who proceeds to take up a similar appointment at Southampton, has been presented by the staff and employés with a framed photograph of the donors, and a wardrobe made from timber taken from the old man-of-war *Royal Albert*, which was broken up 25 years ago.

Halifax Tramways Committee has recommended the T.C. to increase the salary of MR. J. D. CAIRD, traffic manager, from £350 to £375 per annum, with a further increase to £400 a year hence.

General.—As from June 1st, MR. JAMES FLEMING, treasurer to the gas and the electricity departments of the Glasgow Corporation is retiring, and the Corporation has agreed that in future the finances of the two departments concerned shall be handed over to the control of the respective managers, Mr. W. W. Lackie, chief engineer and manager of the electricity department, and Mr. Alexander Wilson, engineer and manager of the gas department. This arrangement will put the electricity and gas departments of the Glasgow Corporation on the same self-contained footing as the Glasgow Tramways Department.

MR. NEEDHAM, acting first assistant electrical engineer at Dover Admiralty Works, has been appointed first assistant electrical engineer at the Bermuda Dockyard. He is succeeded at Dover by MR. J. W. CHURCH, late of Malta.

The marriage took place at Askern (Yorks.) Parish Church, on May 24th, of MR. DAVID ROSSER, electrical engineer, late of Askern, now of South Wales, and Miss E. Silmer Richardson, sixth daughter of Mr. John Richardson, of Moss Road, Askern.

MR. HAROLD W. JACKSON, of the electric telegraph branch of the chief mechanical engineer's department, Lancashire and Yorkshire Railway station, Bolton, has obtained an appointment in the electrical department of the Cape to Cairo Railway, and last week he was made the recipient of numerous gifts from his late colleagues on the Lancashire and Yorkshire Railway. Mr. J. H. Runnett made the presentations.

MR. MARCONI has recently returned to this country from America, and he will almost immediately proceed to Italy to take control of the organisation of the wireless telegraph service of the country.

MR. A. S. MARKS has resigned his position with Messrs. Veritys, Ltd., to become London and South of England representative for Messrs. Ingram & Kemp and Messrs. Sperryn & Co., Ltd. All correspondence should be addressed to his headquarters at 26 and 27, Hatton Garden, E.C.

MR. G. STANLEY WHITE, of the firm of Messrs. George White and Co., Bristol, has been elected a director of the Bristol Tramways and Carriage Co., Ltd., in the place of the late Mr. Hugh G. Doggett. MR. SAMUEL WHITE relinquishes the position of managing director owing to ill-health, but remains on the board. MR. W. G. VERDON SMITH has been appointed managing director. MR. J. H. HOWELL, J.P., has been appointed a director of the Imperial Tramways Co., Ltd., in place of the late Mr. H. G. Doggett.

Obituary.—Amongst the victims in the Gretna Green railway disaster was MR. HERBERT HENRY FORD, manager of the crane department of Messrs. Arroll, of Glasgow. He was 45 years of age, and belonged to Bath, where he was at one time with Messrs. Stothert & Pitt.

MR. W. GORDON, traffic manager of Dublin United Tramways Co., was seized with illness while out riding his horse on May 27th. Mr. Gordon was apparently in his usual health on the Thursday morning last week when he set out on his tour of inspection of the depôts. He was on horseback and was attended by a groom. While passing through Herbert Park he suddenly swayed. The groom tried to prevent his falling, but he did not succeed, and the unfortunate gentleman reached the ground with a thud and expired immediately. Deceased, who was a native of London, had reached his 68th year. He had a wide experience in tramway management in England and on the Continent before his appointment to Dublin in 1899. Mr. Gordon was very popular with the various staffs and with the general public.

The secretary of the Dublin United Tramways Co., MR. R. S. TRESILIAN has also passed away very suddenly. He had arranged for a holiday in the South of Ireland, but his state of health necessitated an operation in hospital. When this had been performed, it was thought that he would go on satisfactorily. Two days later, however, he collapsed. Mr. Tresilian was just over 60 years of age.

Wills.—MR. F. W. LAWSON, a director of Fairbairn, Lawson, Combe Barbour, Ltd., left £128,033 gross and £106,796 net personalty.

The late DR. S. G. RAWSON, Principal of Battersea Polytechnic, and chairman of the Council of the Association of Technical Institutions, left £4,237.

The late MR. THOMAS BULLOUGH, a director of Howard and Bullough, Ltd., left £704,634 gross and £697,128 net personalty.

NEW COMPANIES REGISTERED.

Poulsen Wireless Telegraph Co., Ltd. (140,494).—Registered May 28th, by Steadman, Van Praagh & Gaylor, 4, Suffolk Street, Pall Mall East, S.W. Capital, £450,000 in £1 shares. Objects: to carry on the business of electricians, manufacturers, generators, accumulators, suppliers and distributors of electricity and electrical energy for telegraphic, telephonic, lighting, heating and other purposes, telegraphists, telephonists, proprietors and managers of telegraph and telephone works, lines, systems, stations and exchanges, etc., and to adopt an agreement with the British & Overseas Engineering Syndicate, Ltd. The signatories (with one share each) are: F. S. Gaylor, 4, Suffolk Street, Pall Mall East, S.W., solicitor; A. W. Urquhart, 4, Suffolk Street, Pall Mall East, S.W., clerk; G. Humphries, 4, Suffolk Street, Pall Mall East, S.W., clerk; J. R. Gallort, 4, Suffolk Street, Pall Mall East, S.W., clerk; S. F. Layzell, 20, Ventnor Road, New Cross, S.E., clerk; W. B. Pearson, 4, Suffolk Street, Pall Mall East, S.W., solicitor's managing clerk; E. Holding, 17, Herbert Road, Wimbledon, S.W., clerk. Minimum cash subscription, seven shares. The first directors (to number not less than two or more than six) are: Sir Leigh Hoskyns, Bt., Cotefield, Banbury, Oxon; A. Davidson, 23, Upper Thames Street, E.C.; S. F. St. J. Steadman, 4, Suffolk Street, Pall Mall East, S.W.; L. S. Robertson, 28, Victoria Street, S.W.; V. Gandil, 11, Park Lane, W.; and C. Hage, Stockholmsgade 43, Copenhagen, Denmark. So long as C. Hage, or his personal representative, and the company called Det Kontinentale Syndikat for Poulsen Radio-Telegrafi Aktieselskab, and their original nominees or their personal representatives respectively, hold at least 100,000 shares, the said C. Hage and the said company and the survivor of them shall be entitled to two nominees on the board, and so long as they hold less than 100,000, but not less than 50,000 shares, they shall be entitled to one nominee on the board. Remuneration of directors, £300 each per annum (Chairman, £300), and £1,000 extra, divided between them, in any year when 10 per cent. dividend is paid (increasing to £2,000 if 20 per cent. or more is paid). Registered office: 4, Suffolk Street, Pall Mall East, S.W.

British Bachelet Ordnance Co., Ltd. (140,484).—Registered May 28th, by Ray, Jackman & Falck, 58, Margaret Street, W. Capital, £50,000 in £1 shares. Objects: to carry on the business of manufacturers of and dealers in ordnance of all kinds for naval or military use, machinery, engines, apparatus and accessories, ironmasters, steel makers and converters, colliery proprietors, coke manufacturers, miners, smelters, engineers, metal founders, electricians, electric, magnetic, galvanic and general engineers and contractors, generators and storers of electricity, etc., and to adopt an agreement with C. R. Howes, of 42, Piccadilly, W. The signatories (with one share each) are: H. G. Barrett, Mill Land, Clayton, Sussex, gentleman; T. W. Druitt, Carrig Cleena, Maidenhead, gentleman; F. W. Tagg, 10, Tressillian Road, Brockley, S.E., accountant; L. H. Falck, 58, Margaret Street, W., solicitor; B. A. Cole, Oaklands, Bolton Road, Harrow, clerk; H. Crosland, Woodhurst, Crawley, Sussex, gentleman; C. Vane, 54, Bernard Street, Russell Square, W.C., gentleman. Minimum cash subscription, seven shares. The first directors (to number not less than three or more than seven) are to be appointed by the signatories. Qualification, £5. Remuneration, 10 per cent. of the profits available for distribution, divisible. Secretary: W. E. Newell. Registered office: 166, Piccadilly, W.

Semple and Co., Ltd. (9,402).—This company was registered in Edinburgh on May 28th, with a capital of £1,000 in £1 shares, to acquire the business of electrical and mechanical engineers carried on by Semple & Co., 170, Hope Street, Glasgow. The subscribers (with one share each) are: R. Semple, Jun., Braehead House, Johnstone, mechanical engineer; J. H. Ballantyne, 49, Polwarth Gardens, Glasgow, civil engineer. Private company. The number of directors is not to be less than two or more than seven. The first are R. Semple and J. H. Ballantyne. Qualification, 100 ordinary shares. Remuneration, £10 per annum. Registered office: 170, Hope Street, Glasgow.

Mico, Ltd. (140,440).—This company was registered on May 22nd, with a capital of £500 in £1 shares, to carry on the business of manufacturers of and dealers in accumulators, lamps, batteries, magnetos and electrical apparatus and fittings of all kinds, motor components and accessories, etc. The subscribers are: Mrs. W. H. Hawdon, Yetholm, Elmfield Gardens, Gosforth, 250 shares; J. W. Cook, 57, Norfolk Road, Byker, Newcastle-on-Tyne, accumulator maker, 5 shares; C. F. H. Foster, 24, Beaconsfield Road, Sicke, Coventry, magneto expert, 10 shares. Private company. The number of directors is not to be less than two or more than five. Mrs. W. H. Hawdon is permanent managing director. Solicitor: C. Crowther, 23, Abingdon Street, Westminster.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Cryselco, Ltd.—A memorandum of satisfaction in full on May 19th, 1915, of trust deed dated May 6th, 1910, securing £7,500 first and £7,500 second debenture stock, has been filed.

Trust deed, dated May 20th, 1915, to secure £10,000 debenture stock, charged on Kempston Ironworks, Kempston, Bedfordshire, and company's undertaking and property, present and future, including uncalled capital. Trustees: H. S. Deacon, Kempston, Bedfordshire, and A. Baker, Billiter House, Billiter Street, E.C.

Rawlings Bros., Ltd.—Issue, on May 20th, 1915, of £500 debentures, part of a series of which particulars have already been filed.

Midget Lamp Co., Ltd.—Particulars of £400 second and £1,000 third debentures, created April 8th, 1915, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £400 and £500 respectively. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

James Keith and Blackman Co., Ltd.—Issue, on May 11th, 1915, of £1,000 debentures, part of a series of which particulars have already been filed. Memorandum of satisfaction in full of debentures, dated October 29th, 1901, and February 9th, 1914, securing £1,000 also notified.

Electrical Distribution of Yorkshire, Ltd. (84,972).—Capital, £50,000 in £1 shares. Return dated March 9th, 1915. 37,500 shares taken up; £36,737 10s. paid, leaving £762 10s. in arrears. Mortgages and charges: £5,000.

Bromley (Kent) Electric Light and Power Co., Ltd. (54,127).—Capital, £100,000 in £5 shares. Return dated April 26th, 1915. 15,000 shares taken up; £75,000 paid. Mortgages and charges: £65,003 4½ per cent. debenture stock.

City of London Electric Lighting Co., Ltd. (34,406).—Capital, £1,200,000 in £10 shares (80,000 ordinary and 40,000 preferred). Return dated March 3th, 1915. 70,595 ordinary and 40,000 preferred shares taken up; £1,105,950 paid. Mortgages and charges: £800,000.

Telephone Co. of Egypt, Ltd. (17,824).—Capital £200,000, in 36,000 preferred and 4,000 deferred shares of £5 each. Return dated April 28th, 1915. All shares taken up. £5 per share called up on 24,000 preferred; £120,000 paid; £80,000 considered as paid on 12,000 preferred and 4,000 deferred. Mortgages and charges: £184,251.

Chelsea Electricity Supply Co., Ltd. (20,468).—Capital £400,000, in 74,000 ordinary and 6,000 preferred shares of £5 each. Return dated March 25th, 1915. 49,436 ordinary and 6,000 preferred shares taken up. £5 per share called up on 37,770 ordinary and 6,000 preferred; £218,850 paid; £58,330 considered as paid on 11,666 ordinary. Mortgages and charges: £175,000 debenture stock.

Northampton Electric Light and Power Co., Ltd. (28,640).—Capital £150,000, in 10 "A" and 149,990 "B" shares of £1 each. Return dated March 11th, 1915. 10 "A," 78,500 "B" ordinary, and 31,490 "B" preference shares taken up; £110,000 paid. Mortgages and charges: £58,165.

CITY NOTES.

Anglo-Argentine Tramways Co., Ltd.

Mr. J. B. CONCANNON presided at the annual meeting, held at Winchester House, E.C., on May 27th. He said it was hardly necessary for him to detail the reasons for the set-back which the accounts revealed. They were all familiar with the conditions which prevailed in the Argentine both before and since the war. Whilst the total receipts for the year under review as compared with those of 1913 showed a decrease of £112,196, the net profits declined £24,032 only, thanks to the reduction in working expenses, due mainly to the heavy expenditure upon maintenance in the years 1911, 1912 and 1913,

which resulted in the permanent way, rolling stock, etc., being put in good order, and thereby allowing a substantial reduction to be made under this head in 1914. On the other hand, the debenture charges and interest on temporary loans showed an increase of £123,237, after allowing for interest for works in course of construction charged to capital. The working of the first section of the subway lines had helped materially to reduce the loss from the surface lines during the past and current years. The work of constructing the second subway section had been suspended, the Municipal authorities having met them very handsomely in this respect by sanctioning the postponement of the commencement of the work for one year after the termination of the war. Their investments at cost showed a depreciation of £47,378 on the basis of the estimated market values of December 31st last. The reserve fund of £75,145 was available to meet this deficiency, but (following the precedent of kindred companies) they had not thought it advisable at present to take any action in the matter. During the continuance of the war it was impossible to estimate correctly the value of the investments. They would notice the item of £22,810 in the balance sheet under the heading of deposits with contractors abroad. This represented cash paid on account of cars, etc., ordered from Continental firms which had not been delivered, and pending the termination of the war the matter must be left in suspense. The gross decrease in traffic receipts for the four months ending April 30th last was £92,482, and the net profit showed a reduction of £43,287. Having regard to all the circumstances of the moment, they thought it prudent to carry forward the balance of £96,408 remaining at the credit of net revenue account after payment of all charges and preference dividend. As for the future, he would not attempt to prophesy. They all knew how dependent the Argentine was on good crops and stock-raising. The immediate outlook seemed favourable, as the wheat and maize crops promised to give better results than those of late years, notwithstanding the fact that they seemed to be somewhat prejudiced by the heavy rains which fell during the first three months of the current year; whilst the high freight rates which prevailed at present were a handicap. Still, the ruling prices of meat, wheat, etc., showed a handsome profit to producers. The prosperity of their company depended on the prosperity of the Argentine Republic, and they hoped that the remaining months of the year would show improvement. The company had contributed £300 to the Prince of Wales' Fund and £200 to the Belgian Relief Fund, and they were paying full salaries to four of their London staff who volunteered for the Field.

Mr. C. M. ROSE seconded the motion, and the report was adopted without discussion.

United River Plate Telephone Co., Ltd.

THE annual meeting was held on May 27th at Winchester House, E.C., Mr. GEORGE FRANKLIN presiding. The Chairman, after referring with regret to the death of Mr. David Smith (managing director), said that notwithstanding the general conditions in Argentina, which had been affected by the war, the gross earnings and the net profit were substantially the same for the past two years. The gross earnings for 1914 amounted to £630,651, as compared with £611,657 in 1913, while the gross maintenance and other charges had amounted to £468,846, as against £447,604. The profit for the year was £161,805, as compared with £164,052—a decrease of £2,247, which, under the circumstances, might be considered satisfactory. Included in the expenses were the customary provisions for the maintenance and renewal of plant, on which £129,803 was expended last year, an increase of £23,965 over the previous year. The capital expenditure for the year had absorbed £186,065, of which £70,206 was on account of underground plant, as compared with £364,304 in 1913. On real estate they had expended £46,605 last year, as against £24,671 in 1913. That was following out their policy of substituting underground for overhead plant, and of purchasing land and buildings in which their exchanges were erected instead of having to rely upon tenancies. The reserve for renewal of plant now amounted to £512,535, and that, with the reserve fund account which, after this year's appropriation, would amount to £316,138—formed, in the opinion of the board, an adequate reserve for any wastage likely to occur on the capital expenditure in the Argentine, which now amounted to £2,390,820. The reduction in the capital expenditure last year reflected the policy of the board due to the outbreak of war, because, apart from the fact that the growth of the company's system did not require the extra outlay, they felt that, consistent with business prudence, it was necessary to limit capital expenditure at the present time to the smallest possible amount. The stock of materials stood at £165,474, a reduction during the year of £37,689—a satisfactory feature, as it was manifest that materials on the other side were liable to depreciation. The growth of the business as indicated in the number of subscribers showed, for the first time in the company's history, no increase during the year. That indicated the gravity of the crisis through which Argentina had passed, but it had enabled them to postpone with greater ease the provision of new buildings and the erection of exchanges. The stagnation was only temporary and due to abnormal causes, and while it was impossible to prophesy as to the future they must remember that so far America had escaped the most baneful consequences of the war. The Municipality of Buenos Aires had granted them a new concession on satisfactory terms, under which they were allowed to extend their underground system and put down subways. In Cordoba they now had an excellent automatic system established, and last January they put into service a 5,000-line automatic system at Rosario. During the coming year Argentina should, he thought, show a fair measure of prosperity, and that in its turn should be reflected in the company's business.

Sir F. GREEN seconded the motion which, after a short discussion, was adopted.

Lancashire Power Construction Co., Ltd.

IN their report for the year ended March 31st, 1915, the directors say that during the period the company completed its contract with the Parliamentary Company for the extension of the power station and plant. The balance of profit due thereon, amounting to £1,864, has been brought into the account. The trading profit of the Lancashire Electric Power Co. for 1914 amounted to £29,961, plus interest on hire-purchase plants, etc., amounting to £511, making £30,471, compared with £23,526 for 1913. The balance brought forward from 1913 was £419. Debenture interest has absorbed £4,500, reserve fund £10,000, a dividend of 3 per cent. £12,969, leaving £3,422 to be carried forward. The following figures indicate the development of the company's business:—

	1912.	1913.	1914.
Units generated	23,110,807	28,191,442	32,157,185
Max. load in KW.	6,730	9,720	10,210
H.P. connected	16,400	23,900	27,018
Receipts	£42,773	£54,515	£65,433
Expenditure	£28,156	£31,730	£35,472
Profit on trading	£14,617	£22,785	£29,961

It will be observed that, while the dividend and the amount set aside for reserve have been maintained on the same basis as for 1913, the amount carried forward has been increased by £3,000. The revenue account of the Lancashire Power Construction Co., Ltd., shows that the total receipts for the year ended March 31st, 1915, amount to £19,344, and after deducting the expenditure, £17,110, the available balance of £2,224 is to be carried to reserve account.

Annual meeting, June 10th.

Electric Construction Co., Ltd.

MR. P. E. BEECHCROFT presided at Winchester House, E.C., on May 27th, at the annual meeting. He said that the forecast he made at the last general meeting had been justified, and they were able to submit results that day with which he was sure they were satisfied. The gross profit on manufacturing and contracting amounted to £71,999, an increase of 4.2 per cent. This increase might appear somewhat small, but he would remind them that since 1911 they had recorded substantial improvements year by year from manufacturing and contracting, as the following figures proved:—1910-11, £47,800; 1911-12, £53,700; 1912-13, £62,600; 1913-14, for ten months £57,500=per annum, £69,000; 1914-15, £72,000. In five years, therefore, they had increased their gross profit by more than 50 per cent., and, given ordinarily good times, they did not think they had reached their maximum. The comparatively lower rate of increase last year, however, was affected by the exceptional conditions under which they (in common with all manufacturers) had had to carry on operations. Since the outbreak of war they had suffered from a scarcity of labour, no less than 30 per cent. of their workmen of eligible age having joined the Forces. Great delay had occurred also in obtaining delivery of certain classes of raw material, while the demand for prompt delivery of their products had been insistent, necessitating a considerable amount of overtime. Concurrently, the prices of raw materials (which were almost exclusively manufactured articles) had risen steadily since war was declared, but as they had a considerable amount of orders booked on the old basis they were unable to obtain the benefit of higher prices for their products until the financial year was well advanced. It must not be assumed that the receipt of Government or war orders necessarily meant larger additional profits out of proportion to those accruing to ordinary business; such was not so, at least in their case. Orders had been entrusted to them directly by the Government and by Government contractors which had to be executed under very great pressure, necessitating a good deal of overtime, and he desired to express the appreciation of the directors for the admirable manner in which these orders had been executed. Work had been carried out uncomplainingly, and he thanked all, from the managing director downwards, for their indefatigable zeal and for the manner in which they had met the demand upon their time and energies. Towards the end of the financial year they, in conjunction with other engineering establishments in Wolverhampton, granted an increase in wages of 3s. per week to skilled men and a correspondingly lower increase to unskilled. Recognising also the hardship of the increased cost of living, a war bonus had been granted to members of the staff whose wages were less than 55s. per week—a concession which had been much appreciated. These concessions were not felt to any material extent in their manufacturing profit last year, but he mentioned them in order that they might appreciate their effect during the year now current. General charges had increased at the rate of 7.4 per

cent. per annum, but the increase had been counteracted by lower cost of maintenance of plant and buildings. The total expenditure, therefore, showed no increase, and the whole improvement of £3,000 in gross profit was available for distribution. Having given the comparative gross profit for the past five years, he gave the net profits for the same period:—1910-11, £15,000; 1911-12, £20,300; 1912-13, £27,500; 1913-14, for ten months, £27,000=per annum £32,400; 1914-15, £35,500. These showed that since the increased demand for electrical machinery set in a very large proportion of the increased gross profit had become available for distribution. In other words, the increase in standing charges on the bigger volume of business had been inappreciable. The past year had to some extent benefited in this respect by the extension which had been made to their main factory, and which had materially reduced the cost of handling, in addition to enlarging the output facilities. It might have occurred to some of them that the Board had been ultra-conservative in recommending a dividend of only 6 per cent. on the ordinary shares. In normal times they would have been justified in recommending a larger dividend, but they came to the conclusion that, having regard to all the uncertainties produced by the deplorable war which the nation was now waging, they would be consulting the best interests of the shareholders if they only paid the same rate as last year. The only item in the balance sheet calling for comment was "shares in other companies." This asset was almost entirely represented by their holding in the Electrical Power Storage Co., Ltd., and it had now been written down to what was considered to be the realisable value. An extraordinary general meeting of that company was to be held on June 3rd to consider and, if thought fit, to pass a special resolution for amalgamation with Pritchetts & Gold, Ltd. If the provisional scheme of amalgamation was approved by both companies, the manufacturing operations of the Electrical Power Storage Co. would be transferred to Dagenham, and the economies which would be effected thereby would enable a good dividend to be earned upon the reduced value of the shares. He admitted that they had dealt with the item drastically, but they were now in the happy position of being able to say that every item in the balance sheet stood (subject to what he said last year about the properties, patents and goodwill) at its realisable value or less, every item of a doubtful character having been fully reserved or written down. To enable them to write down the shares in other companies, they had had to transfer £39,403 from general reserve, but they were restoring the sum of £17,403 from last year's profits, making the amount to the credit of general reserve fund £36,000. If they continued to make substantial contributions to general reserve, though not necessarily to the same extent as last year, the item of goodwill in two or three years would be extinguished entirely, and this, in his opinion, should be the aim of every industrial concern. He would again direct their attention to the strong financial position which they enjoyed. Their entire liabilities, apart from debenture stock, were only £22,232, whereas their realisable assets amounted to £173,964, and they had, in addition, £17,983 in cash. From the point of view of the debenture holders and the preference shareholders, he might also point out that, after providing for depreciation, the debenture interest last year was covered six times over, and the dividend on the preference shares almost nine times—a position which he did not think was realised having regard to the market price of these securities. Having referred to the death of Mr. W. Bullock, a director who had acted as manager for 13 years at Wolverhampton; the election of Mr. David Willock, the secretary, to the board; and the appointment of Mr. W. M. Furniss as manager at Wolverhampton, the Chairman said that it was always dangerous to prophesy, but all the indications at present pointed to a busy and successful year.

Mr. J. Gray (Managing Director) seconded the motion, and the report was adopted without discussion.

Replying to a resolution re-electing him as a director, the Chairman said the essential qualities required by a manufacturing business were indefatigable energy and conservative optimism. The first was possessed by their employés at Wolverhampton, and he believed that he himself was a conservative optimist. He believed there was a great future in store for the company.

Prospectuses.—*South Metropolitan Electric Light and Power Co., Ltd.*—**This company has been offering to holders of its shares and debenture stock a further £25,000 of 4½ per cent. first mortgage debenture stock at £95 per cent. and 25,000 6 per cent. cumulative second preference shares of £1 each at par. A commission of £1 per cent. is payable on the debenture stock and of 1s. per share on the preference shares, making the net cost to the subscriber £94 for the debentures and 19s. for the preference shares. The debentures are repayable at par in 1931. The prospectus states that the dividend on the preference shares is covered more than three times over. The money is required to meet the continuous increase in the business.**

The Cornwall Electric Power Co. **is offering for subscription £60,000 5 per cent. debenture stock at 95 per cent.**

Shropshire, Worcestershire and Staffordshire Electric Power Co.—**The report states (according to the *Financier*) that the net revenue for 1914 amounted to £25,366. After deducting expenses, including £250 written off cost of electric lighting orders, the directors propose to add to reserve £4,500, to pay a dividend at the rate of 3 per cent. per annum and to carry forward £899.**

Banbury and District Electric Supply Co., Ltd.—**The report adopted at the annual meeting held on Monday at Electrical Federation Building showed that the number of consumers had increased from 312 to 353, but the number of units sold decreased from 607,447 to 547,439, due to the effect of the war on the business of the district. The revenue was £4,255, and the working expenses were £2,448. After paying debenture interest, putting £600 to renewals, £104 to sinking fund for redemption of debentures, and paying 2½ per cent. on the ordinary shares, £319 is to be carried forward.**

Worcester Electric Traction Co., Ltd.—**The report submitted at the annual meeting held at Electrical Federation Offices, Kingsway, on Monday, showed that the revenue was £18,525 for 1914, as compared with £18,071 for 1913. After deducting expenses chargeable to revenue, including £1,738 for renewals, £4,432 remains. After putting £1,000 to reserve, and paying 3½ per cent. on the ordinary shares, £293 is to be carried forward. The company has sold its motor-omnibus interests to the Worcestershire Motor Transport Co., Ltd., and now holds 8,238 £1 shares out of 19,347 shares issued.**

Petters, Ltd.—**Dividend on the ordinary shares for 1914, at the rate of 5 per cent. per annum, as compared with 10 per cent. for 1913. £2,000 is carried to reserve, and £5,000 to meet war losses.**

Brazilian Traction, Light and Power Co., Ltd.—**A dividend of 1½ per cent. for the three months ending June 30th, 1915, on the 6 per cent. cumulative preference shares, is announced.**

Ruston, Proctor & Co., Ltd. — **Dividend on the ordinary shares for 1914 7 per cent. per annum, carrying to special reserve for contingencies arising out of the war £25,000, and carrying forward £13,353.**

Canadian General Electric Co., Ltd.—**A quarterly dividend of 1¾ per cent. for the three months to the 30th inst. on the common stock is announced.**

Stock Exchange Notice.—**The Committee has ordered the following to be officially quoted:—**

Newcastle-upon-Tyne Electric Supply Co., Ltd.—Further issue of 60,179 ordinary shares of £1 each, fully paid, Nos. 737,501 to 797,679; and 244,832 5 per cent. preference shares of £1 each, fully paid, Nos. 687,501 to 912,332.

Mackay Companies.—**The regular quarterly dividend on the common shares of 1¼ per cent. is announced.**

STOCKS AND SHARES.

Tuesday Evening.

Business in the Stock Exchange continues to plod along quietly. Chief among the themes of discussion is the air raid, of the early part of the week, which took place in the "outlying districts" of London. Although these visitations are becoming sufficiently frequent to make members already somewhat *blasé*, a very different effect has been the stimulus given to recruiting and to underwriting policies. Investment markets are somewhat heavy. A substantial second edition of the War Loan is expected to be made before long, and, pending its arrival, investors in gilt-edged stocks are inclined to hold their hands. It is still remarkable, however, to observe the difficulty that exists in obtaining such first-class shares as those, for instance, of the good electricity supply companies.

An interesting newcomer of the week, the South Metropolitan Electric Light and Power Company provides. This takes the shape of £25,000 4½ per cent. first mortgage debenture stock offered at 95, and 25,000 6 per cent. cumulative second preference shares at £1. As no part of the issue is underwritten, applicants for the debenture stock get it 1 per cent. cheaper, and the preference shares are subject to 1s. per share discount, making the nett cost 94 for the debenture stock, and 19s. per share for the preference. The prospectus shows the interest on the debenture stock and the dividend on the preference shares to be well covered, according to the profits of the past two years. The stock is repayable at par on July 1st, 1931, or earlier, at the company's option, on six months' notice, at 110.

The existing shares were last done at 19s. 9d., and the company's 7 per cent. preference at 23s. 1½d. No transaction has been recorded in the debenture stock since the Stock Exchange reopened at the beginning of January; the price at the end of July, on the eve of the war's outbreak, was 98½. City of London debenture is a point or two lower, and falls of 10s. have taken place in London Electric and St. James' ordinary. Counties fell ⅛ to 11⅜, and London Electric preference weakened to 5 sellers.

Electric Constructions at 13s. are ex dividend, and so are the preference at 1. Babcock & Wilcox are 1s. easier at 2½, and Callenders shed part of their rise of last week. The manufacturing group as a whole is very steady.

Amongst Home Railway stocks, a dwindling tendency is again marked. Underground Electric issues have given way, the income bonds at 76½ being 2¼ down, while the 1s. shares are a

few pence lower. Central London ordinary has failed to maintain the strong front hitherto presented; there is a little stock on offer, and the price has fallen 3 to 77. The 4 per cent. guaranteed preferred ordinary remains at 80, and the deferred is about the same price as the ordinary stock. East London changes hands infrequently on the basis of 4¼, and a bargain has been lately marked in the 4 per cent. "A" debenture stock at 90. Metropolitan Surplus Land is in some demand around 54½, and the company's ordinary stock at 29 is one of the few to show an improvement on the week. Various rumours are afloat with reference to the probability that some of the Home Railway companies will be requiring to make fresh issues of capital before the end of the current six months, and two or three of the steam lines have already approached their stockholders with this object.

The unsettlement produced by the tramway strike acts as a depressing factor upon prices. London United Tramways 4 per cent. debenture stock is 50, and no transactions have been recorded in the issues of the Metropolitan Electric Tramways since the middle of last month. Potteries preference were done at 10s. 6d. a few days ago.

Anglo-Argentine Trams are a better market, on the consideration that the passing of the ordinary dividend is really a bull point for the pre-ordinary descriptions, inasmuch as it enables the company to carry forward a largely increased sum to the new year. The first preference shares have recovered to 4⅜, and the 4 per cent. first debenture stock is 1½ better at 83. Brazilian Tractions dropped to 49 on a shrinkage in the Rio exchange to the round shilling, but there was a subsequent recovery to 50 on the declaration by the company of its usual quarterly dividend on the preferred shares.

That affairs in Mexico are no better is made evident by a circular just issued by the Board of Trade, in which stress is laid upon the huge quantity of paper money now in circulation, some of which there seems every reason to fear will be absolutely valueless when peace comes. "Much of this paper," says the British Vice-Consul at Guaymas, "has been printed and lithographed on such poor paper that it is wearing out, and will disappear or be unredeemable. Moreover, a great deal of counterfeit is in circulation, as well as bank issues without the sanction of such banks." Mexico Tramways common shares changed hands at 30 on Monday, and the second mortgage bonds at 31 two days earlier. In Mexican Light and Power issues the market has come to something like a full-stop for the time being. Auckland Tramways 5 per cent. debenture stock has been done at 101, and Bombay Electrics are firm on the excellent report.

Telegraph and Telephones tend to the duller side, and there are falls in Anglo-American Telegraph preferred, Eastern Extensions, Eastern ordinary and preference, Globe preference, Western ordinary, and West India and Panama. There is no particular pressure to sell, and the dulness arises from the lack of buyers to take what small amount of stock executors of deceased accounts would like to place. Great Northerns rose £1 to 31, and New York Telephone bonds have started to recover. Marconi shares keep very firm, the ordinary being a shade better at 34s., while Canadians are 5s. and Americans 10s.

The Canadian General Electric Company has declared its regular quarterly dividend of 1¾ per cent. on the common stock, which has had the effect of stiffening the price to 92½; while for the preferred there are still buyers in the neighbourhood of 108. Stock and shares in companies connected with Canada have been somewhat dull on the whole, in sympathy with the weakness of American securities engendered by the renewal of the impression that, unless Germany provides the United States with a much more satisfactory answer to President Wilson's demands than that already formulated, America may find herself face to face with the prospect of war. The Consolidated Gas, Electric Light & Power Company, of Baltimore, is another which has declared its regular dividend of 1¾ per cent. on the common stock.

Reuter's Telegram Company's report breathes the hope that the State will recognise the sacrifices entailed upon the undertaking by reason of the war, which brought about Government interference with the business. Reuter's Bank passed its dividend, so that the £15,000 provided from this source last year is missing in the current report. The net profits of £5,900 are about one-sixth of those for 1913; and the company, as already notified, has passed its own dividend. The occasion has been taken, however, of writing off the goodwill account and making substantial allowance for depreciation of investments, including the holding in Reuter's Bank shares. The nominal quotation for the Telegram Company's shares is 4½, but there is next to nothing doing in them, and to get a bid for the shares is naturally difficult.

The Rubber market shows a good deal of firmness, in consequence of good reports recently issued by some of the companies whose shares stand at low prices. These reports came as a pleasant surprise to the market, and, as a favourable influence, served to counteract a trifling decline in the price of the raw stuff. The Armament group is somewhat harder than it was last week. Northern Stock Exchanges, however, are doing so little in their popular shares that London is not disposed to initiate fresh activity in them. The Copper group is supported on the one hand by the firmness of the Paris Bourse, and inclined on the other hand to reflect the dulness apparent in most American securities for the reason already mentioned. The net result of these conflicting currents is that business has shrunk to an exceedingly low ebb.

SHARE LIST OF ELECTRICAL COMPANIES.

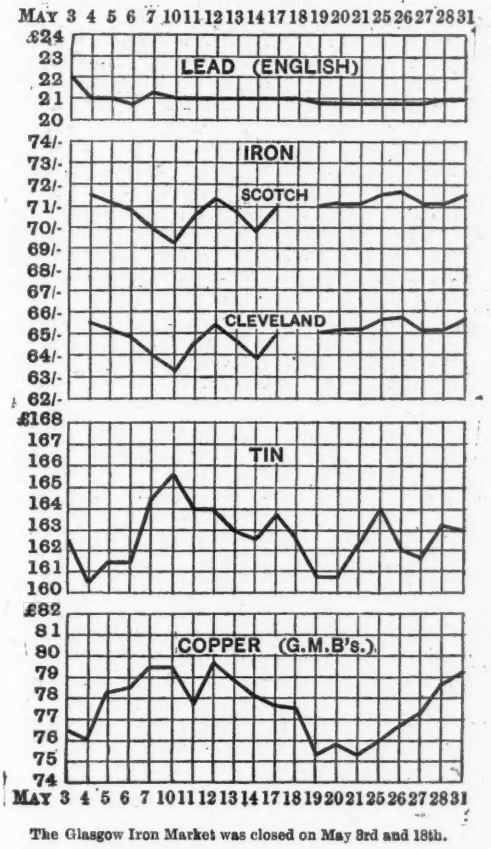
	Dividend, 1914.	Price June 1, 1915.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.				
Brompton Ordinary	10	8½	—	£6 1 8
do. 7 per cent. Pref.	7	7¼	—	4 10 4
Charing Cross Ordinary	5	4¼	—	5 11 1
do. do. 4½ Pref.	4½	4¾	—	5 9 4
do. do. City Pref.	4½	4	—	5 12 6
do. 4 Deb.	4	90	—	4 9 0
Chelsea	5	4⅝	—	5 8 1
do. 4½ Deb.	4½	99	—	4 17 10
City of London	9	14½	—	6 6 4
do. do. 6 per cent. Pref.	6	12¼	—	4 18 0
do. do. 5 Deb.	5	113	—	4 9 3
do. do. 4½ Deb.	4½	96	−2	4 13 10
County of London	7	11⅜	−⅛	6 3 1
do. do. 6 per cent. Pref.	6	11⅛	—	5 4 4
do. do. 1st Deb.	4½	100	—	4 10 0
do. do. 2nd Deb.	4½	95 xd	—	4 14 9
Kensington Ordinary	9	7	—	6 8 7
London Electric	4	1½	−¼	8 0 0
do. do. 6 per cent. Pref.	6	5	—	6 0 0
do. do. 4 Deb.	4	87	—	4 12 0
Metropolitan	8½	8½	—	5 12 5
do. 4½ per cent. Pref.	4½	4	—	5 12 6
do. 4½ Deb.	4½	94	—	4 15 9
do. 3½ Deb.	3½	75	—	4 13 4
St. James' and Pall Mall	10	7½	−½	6 13 4
do. do. do. 7 per cent. Pref.	7	6⅝	—	5 9 10
do. do. do. 3½ Deb.	3½	75	—	4 13 4
South London	5	8	—	6 13 4
South Metropolitan Pref.	7	1⅛	—	6 4 5
Westminster Ordinary	9	7½	—	6 0 0
do. 4½ Pref.	4½	4¾	—	4 12 4
Telegraphs and Telephones.				
Anglo-Am. Tel. Pref.	6	105	−½	5 14 4
do. Def.	1½	22½	−⅜	6 13 4
Chile Telephone	8	6⅝	—	5 18 5
Cuba Sub. Ord.	5	8⅝	—	5 17 8
do. Pref.	10	15	—	6 13 4
Eastern Extension	7	13	−¼	*6 1 3
do. 4 Deb.	4	92	—	4 7 0
Eastern Tel. Ord.	7	133	−1	*6 0 4
do. 3½ Pref.	3½	75	+1	4 13 4
do. 4 Deb.	4	92	—	4 7 0
Globe Tel. and T. Ord.	6	11	—	*6 4 9
do. Pref.	6	11⅛	−⅛	5 9 2
Gt. Northern Tel.	22	31	+1	7 2 0
Indo-European	65/-	54	—	6 0 4
Marconi	20	1⅝	+⅛	11 17 0
New York Tel. 4½	4½	97	+¼	4 13 0
Oriental Telephone Ord.	10	2	—	5 0 0
do. Pref.	6	1⅜	—	5 1 1
Tel. Egypt Deb.	4½	88	—	5 2 3
United R. Plate Tel.	8	6½ xd	—	*7 7 0
do. Pref.	5	5	—	5 0 0
West India and Pan.	1	1¼	−1/16	8 0 0
Western Telegraph	7	19½	−¼	*5 18 5
do. 4 Deb.	4	91	—	4 6 6
Home Rails.				
Central London, Ord. Assented	4	77	−3	5 4 0
Metropolitan	1½	29	+¼	4 7 2
do. District	Nil	16⅜	—	Nil
Underground Electric Ordinary	Nil	1⅝	—	Nil
do. do. "A"	Nil	5/8	−3d.	Nil
do. do. Income	6	76½	−2¼	*9 2 0
Foreign Trams, &c.				
Anglo-Arg. Trams, First Pref.	5½	4⅜	−⅛	6 5 9
do. 2nd Pref.	5½	8¼	—	7 6 8
do. 4 Deb.	4	88	+1½	4 16 3
do. 4½ Deb.	4½	87	−1	5 3 6
do. 5 Deb.	5	87xd	—	5 15 0
Brazil Tractions	6	50	−2	12 0 0
Bombay Electric Pref.	6	10⅜	—	5 16 10
do. 4½ Deb.	4½	91	—	4 19 0
Mexico Trams	Nil	35	—	Nil
do. 5 per cent. Bonds	—	53	—	Nil
do. 6 per cent. Bonds	—	32	−3	Nil
Mexican Light Common	Nil	20	—	Nil
do. Pref.	Nil	39	—	Nil
do. 1st Bonds	—	48	−1	—
Adelaide Sup. 6 per cent. Pref.	6	5⅝	—	5 13 0
do. 5 Deb.	5	103	—	4 17 1
Manufacturing Companies.				
Babcock & Wilcox	14	2½	−1/-	5 12 0
British Aluminium Ord.	5	21/-	—	4 15 8
do. Pref.	6	18/6	—	6 9 9
British Insulated Ord.	15	11½	—	6 13 4
do. Pref.	6	6½	—	5 0 0
British Westinghouse Pref.	7½	1⅛	—	7 15 0
do. 4 Deb.	4	72	—	5 11 1
do. 6 p. lien	6	101	+	5 19 0
Callenders	15	12½	−½	6 2 5
do. 5 Pref.	5	5	—	5 0 0
do. 4½ Deb.	4½	98	—	4 12 4
Castner-Kellner	15	8½	—	4 12 6
Edison & Swan, £3 pd.	Nil	12/9	—	Nil
do. do. fully paid	Nil	1⅞	—	Nil
do. do. 4 Deb.	4	63	—	6 7 0
do. do. 5 % Deb.	5	60	—	8 6 8
Electric Construction	6	13/- xd	—	9 4 8
do. do. Pref.	7	1xd	—	7 0 0
Gen. Elec. Pref.	6	10⅜	—	5 17 8
Henley's	20	14⅞	—	*3 0 4
do. 4½ Pref.	4½	4⅞	—	4 12 4
do. 4½ Deb.	4½	97	—	4 11 9
India-Rubber	5	9	—	5 11 1
Telegraph Con.	20	87	—	6 9 10

* Allowance made for dividends being paid free of income-tax.

Hong-Kong Tramway Co., Ltd. — After charging £6,530 for depreciation and providing for debenture interest, and including £7,479 brought forward, the net profits for 1914 were £17,022. A dividend of 10 per cent. is proposed, writing £2,000 off properties, and leaving £6,897 to be carried forward.—*Financier.*

METAL MARKET.

Fluctuations in May.



The Glasgow Iron Market was closed on May 3rd and 18th.

Russian Electrical Industry: German Control.—A Petrograd paper quotes from an address delivered by V. A. Kieselieff to the Technical Society, Petrograd, on the organisation of the German electrotechnical industry, and the possible results for the Russian electrotechnical industry. He observed that in 1903 there were seven large electrical concerns in Germany which were both producers and consumers of electrical energy. Taking advantage of the support of the banking houses, which promptly recognised the importance of this branch of industry, these concerns made rapid progress. However, after the crisis of 1904-5 the larger concerns absorbed the smaller ones, so that there remained two—the Siemens-Schuckert and the General Electricity Co. With the advantage of their power of extreme specialisation, the great extent of their production and their immense resources, these two companies cover nearly the whole world with a system of electrotechnical concerns which they finance and control. Thus the General Electricity Co. is interested in several electrotechnical concerns, the nominal capital of which reaches the colossal figure of 2,000,000,000 marks. Not content with their *rôle* as producers of electrical energy, these companies soon get into their hands the production of all manner of electrical equipment, and rapidly destroy all competition in respect thereto. At the present moment these two companies, as a fact, hold in their hands the entire electrotechnical industry of Russia. In some form or other they control all branches of production of installation materials in Russia. Some houses that have been nominally considered to be Swiss, Belgian, or French, are upheld really by German capital for the most part. But how is the electrotechnical industry of Russia to extricate itself from this abnormal situation? The lecturer said that the proposition of many to increase the Customs tariff would not serve at all to increase the Russian production, but would rather strengthen still further the German concerns operating in Russia. He considered that the only way out was the formation of a great financial organisation—an "Electrobank"—with plenty of money, which would enable the young Russian electrotechnical industry to compete with German capital. Such a bank with entire absence of risk, as the electrotechnical industry was essentially progressive, judged by German experience, would attract much money, and make it possible for the Russian electrotechnical industry to emerge from German control. The meeting generally agreed with the lecturer, but some of the audience held that the lack of experienced workmen in the country, and the unsatisfactory position of this industry in the schools, necessitated the adoption of corresponding measures for the rectification of these drawbacks.

ELECTRIC POWER IN INDIA.*

By H. R. SPEYER, A.M.I.E.E.

(*Concluded from page 775.*)

The fact of many of the pioneering electric power installations in India not proving so successful as anticipated has in many cases turned the owners of mills, factories and collieries against the use of electric power for industrial purposes, and although to-day this feeling has to a great extent been overcome, it is still a matter of considerable difficulty to convince owners and others that, apart from the saving in capital outlay and running expenses, inherent advantages appertain to the electrical drive which are not possible of achievement with steam.

In textile mills the steady and uniform speed results without doubt in a better quality texture, and the output over the same running hours is materially increased to an extent depending upon the careful lay-out of the machinery, but unfortunately in very few cases, if any, are manufacturers prepared to guarantee these results. Although they are convinced in their own mind that such is the case, it is rarely that one is able to induce manufacturers to convert their beliefs into written guaranteed percentages, which is really the only basis on which it is possible for laymen to base the value of a conversion from steam, which may have done well for 25 years, to electric power. The approximate coal consumption of the mills and factories in India in 1911 was 1,460,000 tons, and the approximate horse-power available for electrification was 250,000 I.H.P.

The lay-out of a mill or factory to operate successfully in India cannot be designed to the best advantage at home, for in each case local conditions and the topographical position of the site must be taken into consideration. Experience has shown that many drives, which have proved eminently successful at home, have not given the best results in India. During the rainy season the average textile mill, after having been shut down on the Saturday afternoon, requires approximately double the amount of power to get under way on the following Monday morning, owing to the abnormal humidity causing the rope drives to tighten during the interval. It is, therefore, advisable when designing an electric drive with either ropes or belts to allow for the starting gear having an overload capacity of 80 to 100 per cent. Experience has shown that whilst in the majority of cases three-phase induction motors are quite capable of dealing with this temporary overload the capacity of the starting gear has been quite inadequate.

The advisability or otherwise, viewed from the manufacturers' point of view, of taking a supply of electrical energy from a public company in preference to generating current on the premises, is being keenly contested at the present moment in one of the largest industrial centres of India.

There is, however, little doubt that for small outputs up to 1,000 H.P. it is far more economical for consumers to take a supply from a local company; but in the case of 15,000 H.P. or more for a 10-12-hour daily load throughout the year, manufacturers realise that with equal facilities for an adequate supply of water for condensing purposes and equal rates for coal, they are in a position to generate electric power as cheaply as a public supply company.

It appears a matter of difficulty to convince manufacturers of the fact that the current supplied by the company represents effective power, whereas in generating power on the premises the difference of cost between indicated and actual horse-power—in which must be included such losses as may be occasioned in the boiler and engine house as well as in the main transmission drives—has to be borne by the mill-owner.

In India during nine months of the year a steady power load due to fans is maintained throughout the 24 hours. The peak lighting load is superposed on the fan load, but the resultant station load-factor (defined as the ratio between the mean and the maximum load) may average as high as 65 per cent. It, therefore, becomes a matter of very serious consideration as to whether a very material advantage is to be gained by an Indian public supply company catering for heavy mill loads which will again be superposed on the fan and lighting peak-loads.

It must be remembered that the revenue per unit obtained from the two latter loads is far in excess of the price which it is possible to charge the mills and factories for a supply in bulk.

If care is not taken to limit the sale of power for such purposes, the earning capacity per kilowatt installed in the station may easily be decreased to a greater extent than it is possible to reduce the standing charges per unit generated, by the introduction of such loads.

The diversity factor obtained with a fan and lighting load is of great advantage to the station, whereas a big power load overlapping the evening peak of the lighting and fan loads may prove the reverse of remunerative, unless the charge for such a power load is saddled with a proportionate charge of the capital expended on general distribution. It would therefore seem necessary for a standing charge to be levied in addition to a rate per unit metered; but such a method of charging appears inexplicable to the mill-owner, and in many cases it is owing to controversy on this point that mill-owners have installed their own plant. It appears, however, that this basis of charging must be enforced in order to safeguard the interests of the supply companies, as it may happen that through a shortage of raw materials or the excess of produc-

* From the *Journal* of the INSTITUTION OF ELECTRICAL ENGINEERS (Abstract).

TABLE II.—ELECTRICAL POWER STATIONS AND PLANTS IN INDIA (WORKING AND IN COURSE OF ERECTION, JUNE, 1913).

Ahmedabad Cotton Mill	Ahmedabad	Currimbhoy Cotton Mill	Bombay	Madras Corps. Plant	Madras
Akola and Mid. India Gin Factory	Akola	Cordite Water-Power Station	Nilghiris	Mahmedbhoy Cotton Mill	Bombay
Anglo-Indian Jute Mill	Calcutta	David Cotton Mill	Bombay	Mathematical Institution	Calcutta
Apollo Cotton Mill	Bombay	Dawn Cotton Mill	"	Monarch Flour Mill	"
Assam Oil Mill	Assam	Delhi Tramway Co.	Delhi	Madras Electric Tramways	Madras
Baroda State Plant	Baroda	Dum Dum Ammunition Factory	Dum Dum	Munnar Hydro-elec. Works	South India
Bengal Iron & Steel Works	Barakur	East India Coal Co.	Calcutta	Mussorie Hydro-elec. Plant	Mussorie
Bengal Nagpur Ry. Works	Calcutta	East Indian Rly. Works	"	Nepal State Hydro-electric Works	Nepal
Bengal & North-West Ry.	Lahore	E. Pabaney Cotton Mill	Bombay	New City Flour Mill	Calcutta
Birkmyre Brothers' Jute Factory	Calcutta	E. D. Sassoon Cotton Mill	"	New City of Bombay Cotton Mill	Bombay
Bikanir City Flour Mill	Bikanir	Elphinstone Cotton Mill	"	New Kaleewarar Cotton Mill	Coimbatore
Bikanir City Oil Mill	"	Empress Cotton Mill	Nagpur	North-Western Ry. Works	Lahore
Bikanir State Plant	"	Fazulbhoy Cotton Mill	Bombay	Noondydroog Mines	Mysore
Bombay, Baroda & Cen. India Rly. Works	Bombay	Finlay Cotton Mill	"	Ocean Jute Press	Calcutta
Bombay Cotton Mill	"	Fort William Flour Mill	Calcutta	Oudh & Rohilkhand Rly.	Oudh
Bombay Electric Tramway and Power Co.	"	Great Indian Peninsular Railway Works	Bombay	Patiala State Plant	Patiala
Bombay Flour Mill	"	Godak Water Falls	Belgaum	Phœnix Cotton Mill	Bombay
Bombay Municipal Sewage Works	"	Gold Mohur Cotton Mills	Bombay	Pondicherry Elec. Inst.	Pondicherry
Bombay United Mills	"	Government Public Works Department	Ootacamund	Quetta Residency Station	Quetta
Buckingham Mills	Madras	Government Press	Madras	Quetta Staff College	"
Budge Budge Mills	Calcutta	Government Printing Press	Yeravda	Rangoon Elec. Tramway	Rangoon
Burma Railway	Rangoon	Government Secretariat	Calcutta	Ranigunj Colliery	Ranigunj
Burma Oil Co.'s Depôt	Calcutta	Gwalior State Plant	Gwalior	Ripon Cotton Mill	Bombay
Bombay Telephone Co.	Bombay	Gwalior State Railway	Gwalior	Sarah Bridge Plant	Sarah
Calcutta Electric Supply Co.	Cossipore	H.M. Mint	Calcutta	Sun Jute Press	Calcutta
Calcutta Ordnance Dept.	"	Hindoosthan Cotton Mill	"	Swan Cotton Mill	Bombay
Calcutta Real Property Co.	Calcutta	India Jute Mill	"	Suraj Jute Press	Calcutta
Calcutta Telegraph Dept.	"	Indian Bleaching and Print Works	Bombay	Sorab Cotton Mill	Bombay
Calcutta Elec. Supply Corp.	"	Indore State Installation	Indore	Srinagar Hydro-elec. Works	Kashmir
Cauvery Falls Works	Mysore	Industrial School	Lucknow	Shri Buldeo Cotton Mills	Hathras
Cawnpore Harness Factory	Cawnpore	Jacob Sassoon Cotton Mill	Bombay	Simla Hydro-elec. Works	Simla
Caxton Printing Works	Bombay	Jamadaba Colliery	Jamadaba	Sun Cotton Mill	Bombay
Central Jute Press	Calcutta	Jamshed Cotton Mill	Bombay	South Indian Railway	Nagapatam
Civil Engineering College	Sibpur	Jubilee Cotton Mill	"	Taj Mahal Hotel	Bombay
Colaba Land Cotton Mill	Bombay	Kolar Goldfields Plant	Mysore	Tata Swadeshi Mill	"
Colombo Tramway Co.	Ceylon	Madhawji Dharamsey Cotton Mill	Bombay	Tata Hydro-elec. Works	Lonavla
Cossipore Gun and Shell Factory	Cossipore	Madras Elec. Supply Corp.	Madras	Tata Iron & Steel Works	Kalimati
Crescent Cotton Mill	Bombay	Madras Portland Cement Works	"	Thomason Eng. College	Roorkee
Crown Cotton Mill	"	Madras Telegraph Dept.	"	Tibutil Gold Mines	Anantpur
				The Times Press	Bombay
				Upper Swat Canal	Malakand
				Victoria Jute Press	Calcutta
				Western India Cotton Mill	Bombay

tion over demand, a number of mills may be shut down two or three days per week over many months of the year.

Detailed data concerning the principal power supply companies in India have been tabulated in Table I.

The largest private generating stations in India are given in Table II.

A number of the Indian State-owned railways have now under consideration important projects for the electrification of inter-urban and main lines, and it is quite likely that many such schemes will mature in the near future.

In conclusion, it may be said that the more important manufacturing centres of India to-day are fully alive to the advantages appertaining to the installation of electric plant, but if British manufacturers are desirous of obtaining a fair percentage of this trade it is essential that they should send out to the country their best men, and should endeavour to standardise a special line of machinery suitable for the unfavourable climatic conditions and unskilled treatment to which the machinery is subjected.

Mill-owners, agents and laymen in general must on their part be prepared to lay aside pre-concerted ideas on the electric drive, and endeavour to grasp simple technical facts, whilst engineers must, on the other hand, be prepared to broaden their outlook to embrace not only technical points but elementary commercial factors. In this way the electrical industry in India will prosper to the advantage of both the mill-owner and British electrical manufacturers.

LOAD FACTOR, OUTPUT AND COST.

BY C. ASHMORE BAKER, A.M.I.E.E.

(*Continued from page* 777.)

A STUDY of the various items which go to make up the total cost of production indicates that the variations from the mean are frequently so great as to render superfluous any closer approximation than a straight line law connecting the logs of load factor output and cost. In the matters of total working expenses and average price charged, however, the extremes do not vary to such a wide extent from the means, and the author has been tempted in the case of these items to push the approximation a stage further.

If we divide our undertakings into three groups, namely:—

(*a*) Those whose load factors are less than 16 per cent.

(*b*) Those whose load factors are 16 per cent. or under 20 per cent., and

(*c*) Those whose load factors are 20 per cent. or over.

And if for each of these groups we find and plot the K.E. relation as already described, we shall obtain the three dark lines A, B and C, fig. 5. It will be observed that if these lines were projected towards the right they would cross, which means (if the logs of K and E were actually related by a straight-line law) that for very large values of K the cost per unit for high load factors would be greater than the cost per unit for low load factors, which is obviously absurd. It is probable, therefore, that instead of being a straight line, the graphic relation between log E and log K is a curve slightly sagging downwards.

If we work out the relation between log log K and log log E for the group of larger towns, as before, we obtain the relation:—

$$\log\log \epsilon = \cdot347 - (\log\log K \times 0{\cdot}711) \quad \ldots \quad (5)$$

where ϵ is the value of E, corresponding with the mean value of λ for the undertakings in question.

Taking as correct the equation connecting λ and ρ already obtained, namely, equation (3), where $\rho = 11{\cdot}8/\lambda - 0{\cdot}831$, E becomes

$$\rho \times \epsilon \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Similarly for the relation between output, load factor and price:—

$$\log\log p = 0{\cdot}289 - (\log\log K \times 1{\cdot}75) \quad \ldots \quad (7)$$

where p = the average price corresponding with the mean value of λ for the undertakings in question.

In this case $\log \rho = 1{\cdot}34 - (\log \lambda \times 1{\cdot}027) \ldots \quad (8)$

so that the average price charged per unit (of total supply) =

$$P = p \times 21{\cdot}6/\lambda\ 1{\cdot}027 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

Diagram 6 has been prepared from equation 6. The dotted curve in fig. 3 is also derived from equation 6, the full curve being worked out from equation 4; in these two curves the mean variation of λ with K has been taken into account as satisfying the equation $\lambda = 9 \times K^{0{\cdot}036}$.

Fig. 6 should be useful in enabling fairly accurate comparisons to be made between undertakings having wide differences in output and load factor.

The usual method of taking into account the influence of load factor consists in dividing the total cost of production into "standing" and "running" charges. From the foregoing equations or from their corresponding diagrams we can ascertain what should be the average working cost for a station of any size and for any load factor under any heading.

Fig. 7 gives a series of curves so calculated for the item E, "total working expenses" for undertakings of various sizes. The equivalents of these curves in practice are usually taken to be straight lines, and they probably would be approximately such for any given undertaking.

It will be noticed that for values of λ above 10 per cent., they are very flat, and might, between reasonable limits, be replaced by

straight lines without serious error. Straight lines have, in fact, been drawn through points calculated to cut the curves at the ordinates representing $\lambda = 10$ per cent. and 30 per cent. respectively. These lines projected back to zero will give us fairly closely the respective standing and running components of working cost for undertakings of the sizes they represent.

The point of intersection with the zero ordinate is the total standing cost per kilowatt exclusive of capital charges, and the slope of the line (that is, the difference between the standing and the total cost at any point divided by the number of units corresponding to the load factor for that point) represents the additional running cost per unit.

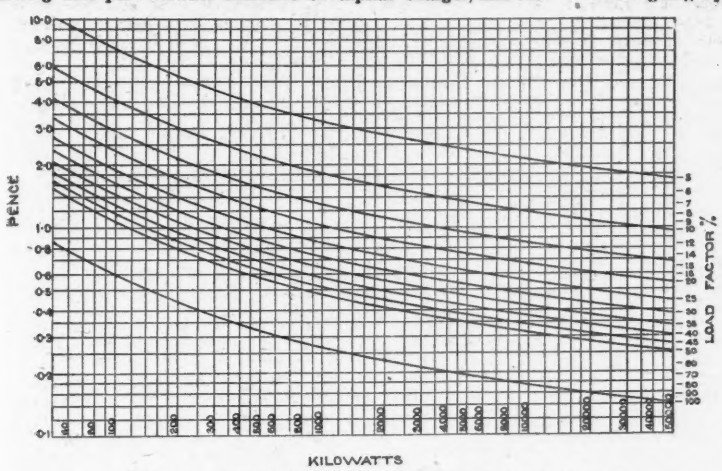


FIG. 6.—TOTAL WORKING EXPENSES PER UNIT SOLD.

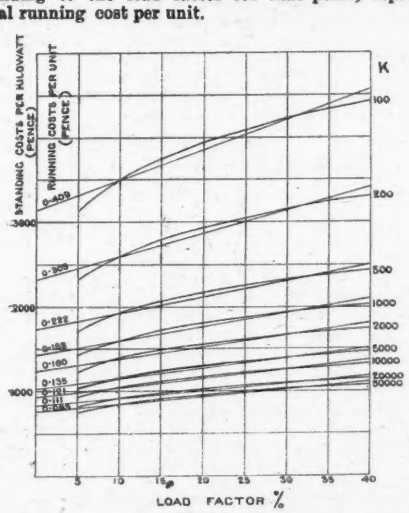


FIG. 7.

It will be noticed that both the standing costs per kilowatt and the running costs per unit vary with the maximum load. These variations are shown in fig. 8, in which the lower curve represents running costs per unit and refers to the left-hand scale. It will be noticed that even in quite small undertakings the running cost should not exceed one-third of a penny per unit. The middle curve represents standing charges in pounds per kilowatt per annum, and refers to the right-hand scale. The upper scale represents the lower curve plus interest and sinking fund at 7½ per cent. on the capital expenditure calculated from curve A, fig. 12.

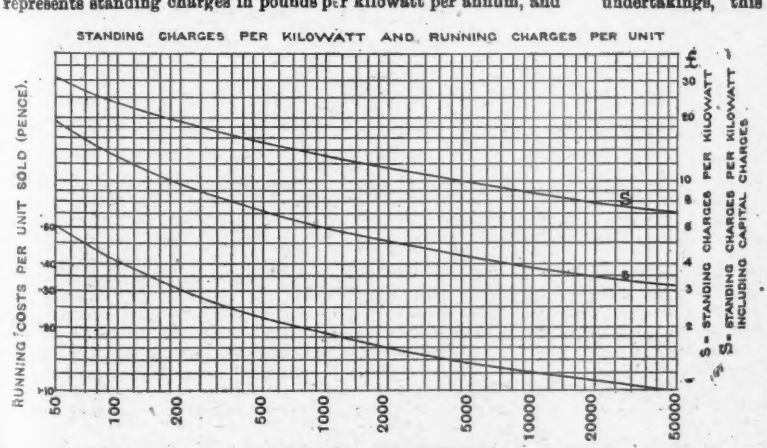

STANDING CHARGES PER KILOWATT AND RUNNING CHARGES PER UNIT
RUNNING COSTS PER UNIT SOLD (PENCE).
S = STANDING CHARGES PER KILOWATT
S1 = STANDING CHARGES PER KILOWATT INCLUDING CAPITAL CHARGES
MAXIMUM LOAD—KILOWATTS.

FIG. 8.

USE OF THE EQUATIONS IN PRACTICE. INFLUENCE OF LOCALITY.

With a view to applying the standard of comparison afforded by the foregoing equations to various classes of undertakings for the purpose of ascertaining the influence of locality on the cost of production, I have divided the municipal undertakings hitherto considered as a single class into three separate classes, namely :—

(*a*) 31 Undertakings situated within the area known as Greater London, and as defined by the Metropolitan Police area.

(*b*) 71 Undertakings situated in or near the various coalfields.

(*c*) 105 Undertakings situated in other provincial towns scattered throughout the British Isles.

The method of comparison is as follows :—

For each class separately an equation was determined connecting the maximum load K with the various items of cost. The relation between K and λ for the class was also determined (fig. 9).

Thus it was possible to plot for each class of undertaking a curve correlating K and each item of cost, and on the same diagram to plot the corresponding standard curve for the same ranges of K and λ.

Here then we have a direct means of comparison size for size, and load factor for load factor, of our three classes of undertaking, with the general averages for municipalities throughout the country.

Taking first the London group, we might reasonably expect to find higher working costs under every head of expenditure.

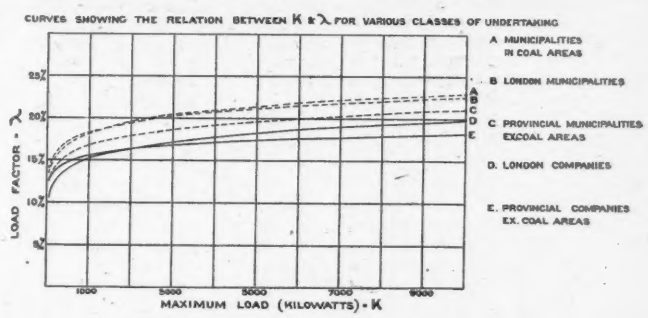

CURVES SHOWING THE RELATION BETWEEN K & λ FOR VARIOUS CLASSES OF UNDERTAKING
A MUNICIPALITIES IN COAL AREAS
B LONDON MUNICIPALITIES
C PROVINCIAL MUNICIPALITIES EXCOAL AREAS
D. LONDON COMPANIES
E. PROVINCIAL COMPANIES EX. COAL AREAS
LOAD FACTOR - λ
MAXIMUM LOAD (KILOWATTS) - K

FIG. 9.

This, however, is noticeably true only for the items "Fuel" and "Management" (which are about 25 per cent. and 50 per cent. respectively in excess of the standard), and "Rent, rates and taxes," of which more hereafter.

The other items are in fairly close agreement with the standard curves.

In fig. 10 is given the diagram comparing the total working costs for London municipalities with the standards, the former being shown in full and the latter in dotted lines.

As regards the coal area towns it is not an easy matter without a personal knowledge of each town to decide whether it should be considered as being in a coal area or not, and my classification must, therefore, be considered as purely arbitrary. An interesting hint is given us in fig. 11 however.

Here it will be seen that, although the coal cost per unit is considerably lower than the general average for the smaller undertakings, this advantage vanishes when we come to the larger towns, Manchester, Glasgow, Birmingham, &c., from which we may conclude that if we want to obtain the full benefit of cheap coal our power houses must be situated above the workings, not merely among them.

Even a short railway journey such as that from the mining suburb into the big town puts up the cost of fuel considerably.

Except as regards the rates and taxes, the remaining items of cost, contrary to commonly held ideas on the subject, do not show any marked divergence from the normal. Generally speaking, they are somewhat lower, owing doubtless to the somewhat lower cost and lower standard of living in coal areas, particularly in the smaller towns.

With regard to the curves for the ordinary provincial towns, little need be said except that they are, as was to be expected, markedly similar to the general average.

The curves relating to "rent, rates and taxes" for the various groups of local authorities, as also for those of companies, are marked chiefly by anomaly.

Thus, in the case of London local authorities the rate per unit under this head increases as the load increases, and therefore as the average price charged decreases. In the case of the coal area towns also this is true, but to a less extent. In the case of the

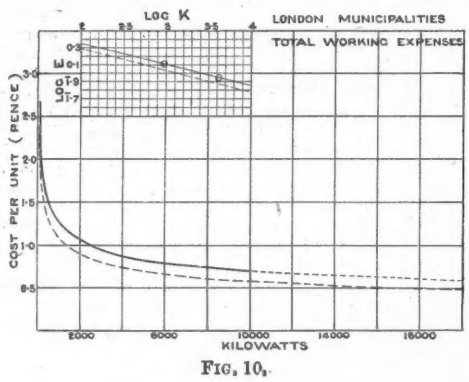


FIG. 10.

ordinary provincial municipalities this item decreases with increased load and with the average price charged. In the case of companies working in ordinary provincial towns the rent,

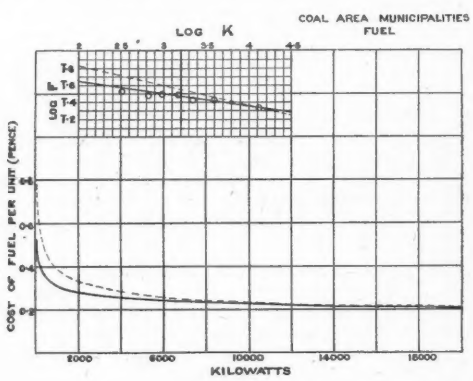


FIG. 11.

rates and taxes item also decreases with the average price, but to a greater extent than in the case of the corresponding municipalities, so that the average charge under this head is in this case *less* for the companies than for local authorities.

With London companies again the "rates, &c." per unit rise with the size of the undertaking as in the case of the municipalities, but the average cost per unit to companies is nearly double that paid by London municipalities.

The whole question is in fact extremely complicated and interesting, and well worth further study, but whether this investigation is properly the function of engineering science or that of the Society for Psychical Research, I do not as yet feel competent to express an opinion.

(*To be continued.*)

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Electrical Tide Gauge.

MESSRS. GENT & CO., LTD., of Faraday Works, Leicester, have recently completed an interesting application of their water level indicating apparatus for the purpose of registering the state of tide during the night, in conjunction with certain dredging operations now being undertaken by Messrs. Topham Jones and Railton.

The apparatus, which is fixed on a timber dolphin about half a mile from the shore, consists of a 25-volt Walker Horrocks automatic electric lighting plant driven by a petrol engine, and having accumulators of 240 ampere-hour capacity for supplying the current to five differently coloured Anchor type lamps.

The mechanism, which is operated by a float fixed in a standpipe under the dolphin, consists of a number of switches operated by a lever which is geared to a chain connected with the float, and as the tide rises and falls every 6 in. difference in level causes the switches to operate, and cut in different groups of lamps in accordance with a prearranged code. Different combinations of red, green and white lamps indicate differences in level from zero to 19 ft. 6 in., and with a spring tide the change of lights takes place approximately every five minutes.

The plant is entirely automatic in working, being self-starting self-regulating, and self-stopping; occasional oiling and replenishing of fuel only are required. If the engine fails to start, a warning is given by a red light at the side of the engine-house, but the cells will supply light for about four days after this warning has been given. A time switch is used in the circuit to cut off the current during the day time.

Railway Carriage Lighting.

In view of the great amount of attention that the subject of the correct illumination of railway carriages has recently been receiving at the hands of the illuminating engineers of railway companies and others, the accompanying illustration is of interest.

This railway carriage is one of a large number built by the Metropolitan Carriage, Wagon and Finance Co., Ltd., at Saltley, Birmingham, for the Central Argentine Railway. The overall dimensions of the carriage are approximately 66 ft. × 9 ft. It is divided into two compartments, each 25 ft. × 9 ft., and in

HOLOPHANE LIGHTING IN A RAILWAY CARRIAGE.

each compartment are installed four 12-in. Holophane Reflector bowls (each equipped with two 40-watt lamps) down the centre of the coach, whilst on either side there are four Holophane Pines, No. 3,150, with 40-watt lamps.

The power provided in this case is very liberal, enabling an illumination intensity of 6 ft.-candles to be obtained uniformly over the whole reading plane. Notwithstanding that the illumination intensity is so high, excellent diffusion and evenness are obtained from the use of the Holophane glassware, whilst glare and shadows are obviated. The carriage has a lively and pleasing appearance when illuminated, and the handsome furnishings are shown up to advantage.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Cab Signalling.

I notice in your issue of May 21st an article by Mr. W. H. Dammond, of Nottingham, with reference to "cab signalling." He still calls the Railophone a "toy," and adds that it is a "very frivolous waste of time" to test a toy.

Mr. Dammond reminds me of a child whose toy is always better than anybody else's, and who never gives credit to the work involved in designing toys. He condemns the Railophone without knowing anything about it, and judges in a very autocratic manner what is right and what is wrong. After he has run everything down in a wholesale fashion, he thinks it fitting to ask Mr. Acfield to explain some important details of the Railophone. Then, before finishing his illogical outburst, he groups the wireless inductive (Faradic) system of the Railophone with the radio-active (Hertzian) wave system, and declares them both "decidedly wrong." I do not think he would know the real difference between these two systems, and so he comes to the following conclusion:—"The

wireless impulse tries as hard to go to the wrong locomotive as it does to go to the right one, but the same is not true with the ramp system."

I agree with him as far as a purely wireless or Hertzian system and his ramp are concerned, especially when a ramp is bodily torn up by a passing train, as happened last year, when the ramp made no attempt to go to a wrong train.

I do, however, not at all agree with him about his argument, viz., that the same happens with the Railophone. First of all, the Railophone is a true positive safety system and the ramp is the reverse. Secondly, with the Railophone, continuous control of the trains is assured and a positive clear signal is obtained on the train, which, by the arrangement of the primary circuit, is converted into a positive danger signal. Those who have studied the inductive researches and tests I have carried out, and all those who are conversant with the laws of induction, know that the governing factor of a Railophone plant is the "mutual" induction between the two circuits. Such mutual induction depends on the dispositions and dimensions of the primary or stationary circuit, both being of a rectangular shape and parallel. Now in the calculation of a mutual inductance, the net inductive force creating a current in the secondary depends on the logarithmic value of the respective distances between the limbs of the primary and the secondary circuits.

Such value in a Railophone plant of correct design is the $\log_{10} 2$, so that we can write:—

$$M = k \times \log_{10} 2$$

for the safety zones, and:—

$$M = k \times \log_{10} 1$$

for the danger zones.

As $\log_{10} 1 = 0$, we have proof of the soundness of a Railophonic induction plant.

I may mention for the information of your readers, that with a Railophone plant the value for the constant k is approximately $k = 000555$.

As, I believe, I have previously promised you to furnish the technical Press with all the details of my research work, now extending over five years, I shall be pleased to give your readers full particulars and diagrams, as soon as time and circumstances permit, and if the railway companies desire me to do so.

In the meantime, I am glad to have succeeded in amusing Mr. Dammond with the "Toy on the Midland."

H. V. Kramer.

Edgbaston, *May 25th*, 1915.

About a year ago I was in a signal-box at a place near Orleans, where a wreck like the one at Gretna cannot occur; but, of course, such dangerous and primitive makeshifts as lever collars are not relied upon for safety there.

Elsewhere in France and at thousands of places in the United States and Canada I have seen at work what I saw near Orleans, viz., electrical apparatus which yields a far higher degree of safety than can possibly be attained by such a crude mechanical device as a lever collar.

If a signalman is to blame for not making the prescribed use of a device that no railway ought to be allowed to employ, then the Board of Trade is even more culpable for sanctioning the employment of such a death-dealing anachronism. One engineering expert has rightly said: "The lever collar is merely a patch on the signalling system." He would have been justified in adding that it is a patch which obscures the dangers of, but does not mend, a system that is thoroughly bad.

The assertion that "it will be a long time before the signalman can be replaced, even to a limited extent" is one that ceased to be true at least a quarter of a century ago. On more than 25,000 miles of steam railway track, the signalman has been completely replaced in the matter of guarding against wrecks like that at Gretna; and on more than 10 per cent. of this mileage his elimination from this matter was effected as long as 10 years ago. Electrical equipment has relieved the signalman of cares which cannot safely or justly devolve upon the "human element"; and, as a result, the signalman has, in these cases, been free to concentrate his attention on those responsibilities with which he can legitimately be charged. On all this vast mileage, the extinction of wrecks of the Gretna species has synchronised with this "replacing" of the signalman.

Every mile of English high-speed express routes ought to have been track-circuited at least 10 years ago. That this has not been done is a matter for which the Board of Trade deserves the severest kind of condemnation. One does not need to go farther back than Colchester to find a Board of Trade Inspector actually sanctioning the employment of lever collars. If the Board's inspectors had, during all these years, been performing their duty of making proper preventive recommendations and of condemning dangerous signalling methods, it is quite certain that such primitive and clumsy death-traps as lever collars, release keys for block instruments, and the rotary lock-and-block, would have disappeared from British railways, and that electrical methods of proved efficiency would be universal thereon. In that case the worst collision in British history would have been prevented.

During the last six years fatal wrecks of the Gretna class have been second in number only to those of the Aisgill species. The existence of a preventive for wrecks of each kind has been well known, for 30 years as to the former and for four years as to the latter kind, both preventives being electrical. These expedients are the track circuit for the Gretna class, and visual and audible three-indication cab signals of the ramp type for the Aisgill class. In the last six years the Board of Trade Inspectors have occasionally made proper preventive recommendations as to the former, but have not once done so regarding the latter class of fatal railway wrecks.

Wm. H. Dammond.

Nottingham, *May 30th*, 1915.

Karachi (India) Tramways (Petrol).

With regard to the reference made in a recent issue of the Electrical Review to the Karachi tramway extensions, I should like to point out that the Karachi tramways, which belong to my company, though serving a population of over 140,000, are not an "electric" undertaking, but are entirely operated by "Simplex" self-contained petrol cars.

The extensions now under construction are to provide a tramway service to the new Goa-Portuguese settlements known as Cincinatus Town, and will be worked by self-propelled cars similar to those on the other parts of our system. In fact, were it not for this economic type of traction requiring but a small capital outlay compared with electric installations, it would not have been possible for the company to have entertained these extensions, going, as they do, to a sparsely-populated, but growing, district.

Geo. Gale,
Secretary, East India Tramways Co., Ltd

London, E.C., *May 29th*, 1915.

LEGAL.

Merchandise Marks Act Prosecution.

At the Mansion House Police Court, on the 27th ult., the British Thomson-Houston Co., Ltd., of Mazda House, E.C., were summoned before Ald. Sir John Knill, for unlawfully applying and selling an electrophone to which a false trade description had been applied, in contravention of the Merchandise Marks Act, 1887. Mr. J. Hunter Gray appeared for the company, who pleaded not guilty to the summonses.

Mr. Bodkin, who prosecuted, said the proceedings were at the instance of a Mr. Hammer, the owner of certain patents and registered designs in connection with electrophones, a contrivance which by the aid of an electric battery would help deaf people to hear. Mr. Hammer, counsel went on to say, was connected in 1912 and 1913 with a London company for representing an American company called the Stolz Electrophone Co., of Chicago, and being connected with that company and the owner of patents, an arrangement was come to between that company and the British Thomson-Houston Co., Ltd., to manufacture electrophones according to a description of patent of which Mr. Hammer was the owner. After much correspondence, an order was placed with the British Thomson-Houston Co. to manufacture a large number of electrophones for the Stolz London company, the former company taking a collateral guarantee for payment. Four thousand electrophones were to be manufactured. A sample instrument was submitted for the approval of the patentee, and the order was to be executed according to this model, by the defendant company. For the purpose of turning out these instruments a large quantity of tools of a special kind had to be made by the defendants. From the correspondence it appeared, said Mr. Bodkin, that the goods were not to be manufactured at the company's works at Rugby, but were to be made in Berlin.

Mr. Gray: I object to this. The company never had works at Berlin.

Mr. Bodkin: I am only speaking from my instructions, and I have here a letter in which occurs the sentence, "We will write from our Berlin factory, &c."

Mr. Gray: That is wrong. We have no Berlin factory. I have not seen that letter.

Mr. Bodkin: This is only one of several letters which confirm the same thing. In the correspondence, Mr. Bodkin said, a question was raised as to how these goods, manufactured, as it was understood, in Berlin, ought to be marked in order to comply with the Merchandise Marks Act, for there would be a breach of that statute if they were marked "Made in London," when in fact they were manufactured abroad. In order to conform to the law, the words "Made in Germany" were stamped upon the completed articles supplied by the defendant company. These instruments embodied certain designs as well as patents, and it was necessary, in order to preserve the rights of the owner of the designs, to stamp the articles with a registered number. With regard to the 4,000 order the Stolz London company went into liquidation, and the guarantee for the payment to the defendant company for the instruments by Mr. Holt became worthless. The result was that the defendants having manufactured a good number of these electrophones, stamped "Made in Germany," they had them on their hands unpaid for. The reason payment was not made, which Mr. Hammer gave, was that the articles, between 150 and 200 of the first consignment sent, were not in accordance with the Merchandise Marks Act as regarded the mark applied to them. Mr. Bodkin, in explanation, produced an electrophone in Court for the inspection of the magistrate. On the top of the transmitter, he pointed out, there was a sort of metal loop, adapted to hook on to the coat of a person using the instrument. This was screwed to the back of the instrument t

prevent any meddling and putting the instrument out of gear. It was contended on the part of the prosecution that, as this metal hook covered up the words "Made in Germany," this article was not marked in accordance with the Act. This covering up of the words mentioned was the reason for the refusal to pay for goods manufactured in this way. On the back of the instrument there was a line which read, "Registered design, No. ——," but, said Mr. Bodkin, the instrument could not be possibly defined, because the registered number had been deliberately defaced; while on those goods supplied by the defendants on which the words "Made in Germany" were concealed, the registered number was plainly visible. The Stolz London company having gone into liquidation, and the order for the manufacture of these instruments having come to an end, Mr. Hammer eventually discovered that the defendants were selling electrophones of the British Thomson-Houston Co., and for the purpose of ascertaining what sort of instrument it was that they were selling, Mr. Peters, clerk in the office of the solicitors prosecuting, purchased one. On the front the name Stolz was omitted; on the back a metal hook covered up the words "Made in Germany," and the number had been defaced. Upon examination, Mr. Hammer found that the instrument was an exactly similar thing to his own patent, and accordingly the present proceedings were brought. In November last defendant company sent out a circular, headed "The British Thomson-Houston Electrophone," and represented to the public that they had produced a reliable instrument with all the latest improvements embodied in it. It did not convey, said Mr. Bodkin, that these goods were the subject of another person's patent. It was suggested that this company, in order not to suffer a bad debt, had adopted this registered design and patent as their own, and had advertised the sale of the instrument, as if they were the owners of it. On no part of the instrument purchased appeared the description British-Thomson Houston Co., as the manufacturers, but there was the name on the original goods, and also a serial number indicating that they were the manufacturers. This, however, was obliterated in respect of the goods the defendants were advertising for sale. Evidence was called in support of the summons, and the further hearing was adjourned.

INSTITUTION OF ELECTRICAL ENGINEERS.

THE annual general meeting was held on Thursday last week. The President, Sir John Snell, referring to the result of the ballot for members of Council, expressed a wish that the members themselves would nominate candidates in addition to the names suggested by the Council, so that that body should be made as thoroughly representative as possible. In connection with the work done for the War Office in selecting men for commissions in the Army, he stated that not one of the nominations the Institution had made had been turned down; and some of the officers had already received promotion. The President drew attention to the paragraph in the Report which related to the formation of a special Committee, and remarking that the Council had been criticised for its inability to take effective action in industrial matters, he pointed out that the British Electrical and Allied Manufacturers' Association had been consulted, and fully concurred in the decision arrived at, that nothing could be done to foster British trade during the war; things would solve themselves in due course. In the matter of the duration of loans for engineering works, the President was associated with the Presidents of the Institutions of Civil and Mechanical Engineers in making representations to the Local Government Board. He made a strong appeal to the members to support their Benevolent Fund, on which calls were certain to be made as the outcome of the war.

On the motion that the Report be adopted, MR. LL. B. ATKINSON asked that the names of members of I.E.E. Committees should be published, and suggested that the Benevolent Fund, which was quite unworthy of that Institution, had not been brought before the notice of the members as it should have been.

MR. W. M. MORDEY said that the contributions to the Fund amounted to an average of only 6d. a member; it was urgently necessary that the fund should be increased, and he thought that large numbers of small contributions were especially desirable. Mr. Rawlings agreed, suggesting a maximum of 5s., and Mr. Raphael proposed that a large committee should be formed, to invite contributions from friends and from manufacturing firms.

Replying to these and other points that were raised, the President said they would receive careful consideration. The reduction of membership was partly due to the examinations, but the class of candidate that was coming forward was distinctly higher than formerly. Part of the reduction was the result of the troubled times they were passing through.

Introducing the Statement of Accounts, the hon. treasurer, Mr. Robt. Hammond, said that with the reduced membership they had to record a reduced net income—£1,200 less than last year: but the latter was an abnormal year. The assets at cost were £114,929, and their liabilities £43,359, leaving a margin of £71,569, which showed an improvement of £2,046.

The Report and Accounts were adopted *nem. con.*, and the usual votes of thanks to the hon. solicitors and the hon. auditors were recorded.

The ballot for five "ordinary members of Council" resulted in the election of Prof. T. Mather and Messrs. W. A. Chamen, H. Dickinson, H. F. Proctor and G. S. Ram. The remaining vacancies were filled as shown in the ELECTRICAL REVIEW, of April 2nd, page 477.

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & CO., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

7,358. "Receiving arrangement for wireless telegraphy." GES FUR DRAHTLOSE TELEGRAPHIE M.B.H. May 17th. (Addition to 5,342/15.) (Convention date, May 30th, 1914, Germany). (Complete.)

7,366. "Electric transmission for automobile vehicles." DAIMLER CO., LTD., F. W. LANCHESTER, & J. W. MILLIGAN. May 17th.

7,367. "Wireless signalling systems." BRITISH THOMSON-HOUSTON CO., LTD. May 17th. (General Electric Co., United States.)

7,373. "Sound-receiver for thermic telephones." NAAMLOOZE VENNOOTSCHAP DE NEDERLANDSCHE THERMO-TELEPHOON MAATSCCHAPPIJ. May 17th. (Convention date, April 16th, 1915, Germany.) (Complete.)

7,374. "Electric generators." J. L. MILTON. May 17th. (Convention date, May 15th, 1914, United States.) (Complete.)

7,433. "Electric air-heater." F. L. MCKINNON. May 18th.

7,457. "Electric distributing system." W. H. COLE. May 18th. (Complete.)

7,481. "Method of actuating an electric bell without sparking." T. F. WALL. May 19th.

7,485. "Contact mine-destroyer." J. C. DUNMER. May 19th.

7,492. "Electric soldering-irons." M. J. RAILING & H. IDE. May 19th.

7,498. "Electric-conductor-rail anchor-clip." H. SCOTT. May 19th.

7,510. "Devices for adjustably suspending electric and other lamps, electroliers, gas pendants, and other articles." W. H. STURGE. May 19th. (Complete.)

7,517. "Electrically-operated railway signals." A. ENEFER. May 19th.

7,522. "Insulated materials applicable to articles of wearing-apparel." W. J. B. WESTLAKE. May 19th.

7,546. "Electric accumulators or storage batteries for use in electric battery lamps." S. D. SMITH. May 19th.

7,554. "Combined electric switches and plugs." A. H. RAILING, C. C. GARRARD, & A. F. SEARLE. May 20th.

7,574. "Electrical switches." L. CADENEL. May 20th. (Addition to 7151/15.) (Complete.)

7,575. "Liquid sealed valves." BRITISH WESTINGHOUSE ELECTRIC & MANUFACTURING CO., LTD. May 20th. (Convention date, June 9th, 1914, United States.) (Complete.)

7,579. "Telegraphy." E. S. HEURTLEY. May 20th.

7,584. "Apparatus for or relative to receiving, transmitting, and recording vibrations." E. ROE. May 20th.

7,607. "Armouring for simple-core electric cables for alternating currents." A. ROSSELLI. May 20th. (Complete.)

7,622. "Electric lamps as applied for advertising purposes." W. C. JEANS & JEANS, LTD. May 21st.

7,638. "Control of electric motors." C. F. BRINDLEY. May 21st.

7,641. "Means for maintaining uniformity of speed of a series of co-related motors." J. R. HAPPER. May 21st.

7,647. "Junction boxes and the like for electric wiring installations." G. S. BOOTHROYD & CALLENDER'S CABLE & CONSTRUCTION CO., LTD. May 21st.

7,661. "Fuse length indicators." G. E. MAPPIN. May 21st.

7,673. "Electric torch and compass in a stick or umbrella or the like." K. S. JASSAWALLA. May 21st.

7,675. "Manufacture of electric cables." W. F. SMITH. May 22nd. (Convention date, May 23rd, 1914, United States.) (Complete.)

7,685. "Sparking-plug for internal-combustion engines." J. KNIGHT & J. H. FOSTER. May 22nd.

7,704. "Telephone systems." RELAY AUTOMATIC TELEPHONE CO., LTD., & L. C. BYGRAVE. May 22nd.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & CO., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1914.

5,294. TELEGRAPHY. W. Judd, A. Fraser, K. L. Wood, & Eastern Telegraph Co. March 2nd. (Cognate application 20,274/14.)

7,298. ELECTRIC LAMP SOCKETS. R. B. Benjamin. March 23rd. (April 11th, 1913.)

10,822. OPERATIONS ON ALTERNATING-CURRENT DISTRIBUTING SYSTEMS. A. G. Collis and Crompton & Co., Ltd. May 2nd.

10,872. BEARINGS OR WEARING-SURFACES. British Thomson-Houston Co. (General Electric Co.). May 2nd.

10,938. ELECTRICAL CONTROL AND OPERATION OF RAILWAY POINTS AND THE LIKE. A. E. Alexander (Union Switch & Signal Co.). May 4th.

11,083. TRANSPORT OF ELECTRIC SEARCH-LIGHTS OR PROJECTORS. Soc. Anon. Des Automobiles & Cycles Peugeot. May 5th. (May 6th, 1913.)

11,116. ELECTRICAL REACTANCE COILS. P. Torchio. May 5th.

11,399. DYNAMO-ELECTRIC MACHINES. Crompton & Co. & N. Pensabene. May 8th.

11,599. PORTABLE ELECTRIC SAFETY LAMPS FOR USE IN MINES OR OTHER PLACES. L. Bristol. May 11th.

12,189. MEANS FOR GIVING A SERIES OF ELECTRIC FLASHES OF LIGHT FROM A BICYCLE OR THE LIKE WHEN IN MOTION. C. H. Hulbert. May 18th.

12,913. ELECTRIC IMPULSE-PRODUCING MECHANISMS. J. A. Kropp. May 26th. (July 29th, 1913.)

13,538. ELECTRIC WELDING AND FUSION DEPOSITION OF METALS. A. P. Strohmenger. June 3rd.

13,706. CENTRIFUGAL GOVERNORS FOR INTERNAL-COMBUSTION ENGINES OF VEHICLES HAVING ELECTRIC POWER TRANSMISSION MECHANISM. Geb. Sulzer (firm of). June 5th. (September 16th, 1913.)

14,159. ELECTRIC FUSES. A. H. Railing & C. C. Garrard. June 12th.

14,861. MANUFACTURE AND CONSTRUCTION OF COMMUTATORS FOR DYNAMO-ELECTRIC MACHINES. A. H. Midgley & C. A. Vandervell. June 29th.

16,363. ELECTRIC LAMP HOLDERS OR OTHER COUPLING MEMBERS. G. St. J. Day. July 9th.

16,509. SECONDARY GALVANIC BATTERIES. O. Oldham. July 10th.

17,396. GAS VALVES AND ELECTRIC SWITCHES. A. E. Lamkin. July 22nd.

19,197. BOXES OR CONTAINERS FOR ELECTRIC BATTERIES, CHIEFLY DESIGNED FOR USE ON AUTOMOBILE VEHICLES AND LIKE POSITIONS. F. H. Bluemel & Bluemel Bros., Ltd. August 28th.

20,168. ELECTRIC LIGHTING AND BATTERY CHARGING SYSTEMS FOR AUTOMOBILES AND ANALOGOUS PURPOSES. F. G. Brettell (Apple Elecrtic Co.). September 25th. (Divided application on 10,251/14, April 25th.)

21,271. ELECTRIC MOTOR CONTROL SYSTEMS. C. W. Yerger. October 20th.

22,149. MAGNETO-ELECTRIC MACHINES FOR IGNITION SYSTEMS. C. T. Mason. November 6th. (November 6th, 1914.)

23,555. COMBINED INCANDESCENT ELECTRIC LAMP FOR REFLECTOR. C. P. Lawson. December 5th.